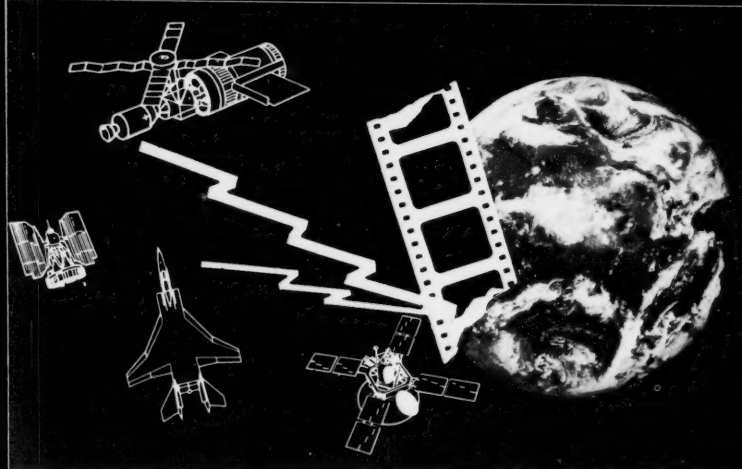


NASA ACTIVITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

November 15, 1974

Vol. 5, No. 11

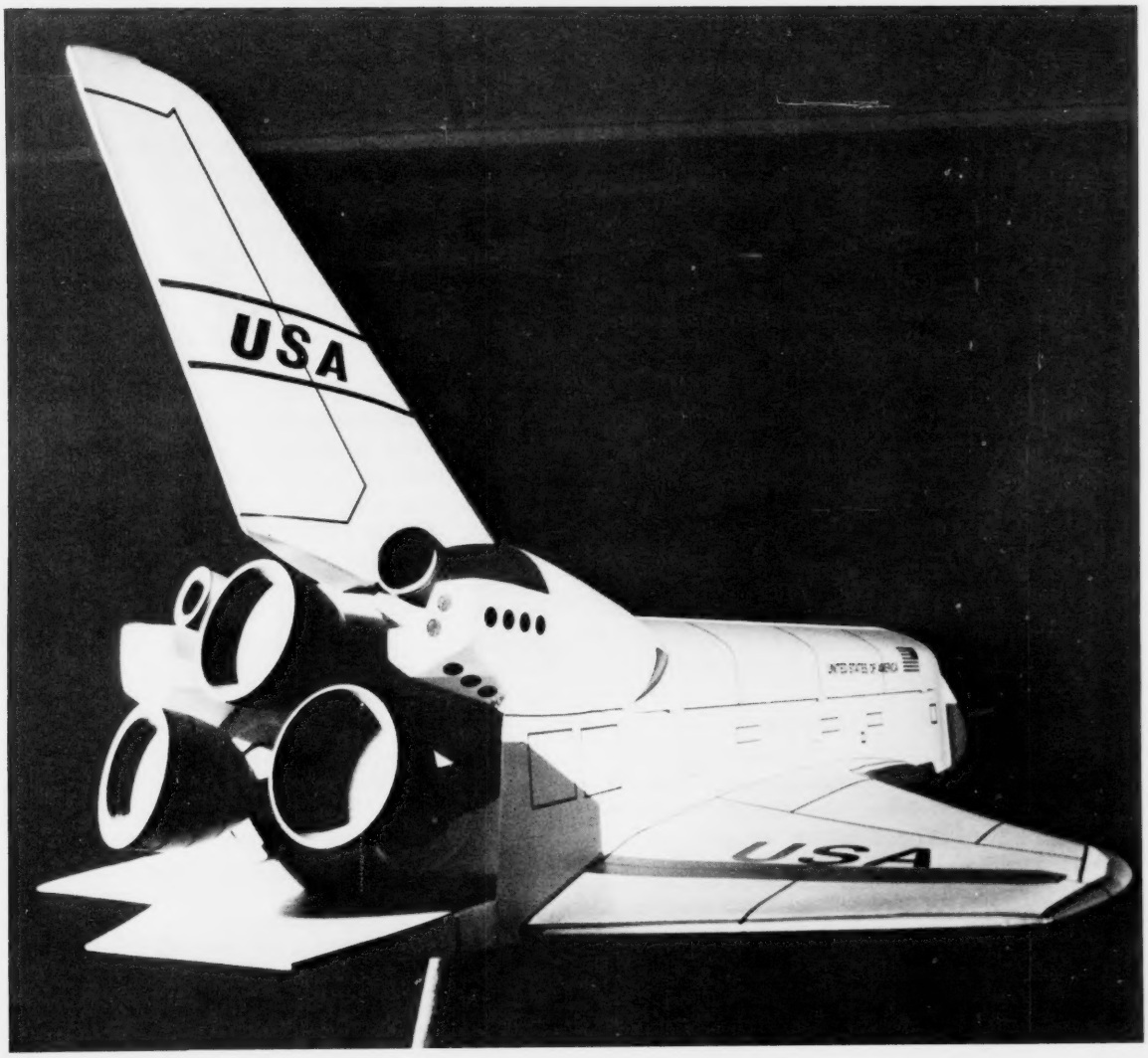


TABLE OF CONTENTS

Fletcher Proposes 50% Aircraft Fuel Usage Cut ...2
Monthly NASA Highlights 7
JPL's Earthquake Prediction System 9
Technology Review at LaRC 11
What the Future Holds for Space 12
Fair Treatment Seen as Aid to NASA 15
Congresswoman Griffiths Champions Women's Cause 16
JPL, Caltech Featured on Medallions 17
Speaking of Space, Alice 18
Boyd Myers Honored 19
NASA Presents 91 Awards 20
Low Cost Corner 21
Mrs. Harris Honored 22
MSFC Aids Minorities 22
Solar Heating and Cooling Program 23
Fletcher Visits Japan 23
Relaying Hurricane Messages 24
Soviet Flight Controllers Train 24
Zeiler to Retire 25
Research Review Sponsored 25
Measuring Earth's Rainfall 25
3 MSFC Employees Attend IAF Congress 26
Cernan Visits Europe 26
KSC Minority Council 28
MSFC Braces for Tornadoes 28
New NASA Publications 27
Film Activity 29
Radio-Television 29
Lunar Sample Exhibits 29
Key Awards 29
Headquarters Press Releases 30
Patents and Inventions 30
1974 Launch Schedule 30
Your 1¢ Worth from Space 32

NASA ACTIVITIES is published monthly by the National Aeronautics and Space Administration, for the information of the Agency's employees.

Contributions and recommendations are solicited from Headquarters and Field Centers and should be addressed to the Office of Public Affairs, Code FGC, Washington, D.C. 20546.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Annual subscription rate: $6.70 domestic; $8.40 foreign. Price per single copy: 60 cents. Back issues not available.

50% AIRCRAFT FUEL USAGE CUT PROPOSED BY FLETCHER

Administrator Says Future of Aeronautics Depends on Recruiting Young People

A goal of providing "the technology needed to produce aircraft fuel savings of 50 percent within the next 20 years" was proposed by Dr. James C. Fletcher, NASA Administrator, in a talk before the NASA-University Conference on Aeronautics held at the University of Kansas Oct. 23.

Announcing that he was convinced the goal could be reached, he accompanied his prediction with a warning to industry, government, and the universities that the future of aviation in this country depends on maintaining a high quality university program which will bring "bright, imaginative, productive young people" into the field.

The text of his address follows almost in its entirety:

"Today we are here to discuss and assess the trends in aeronautics and aeronautical education. I propose to discuss matters relating to the future roles of industry, government, and the universities in aeronautics.

"America's belief in and support of aeronautics has established the United States in a position of world leadership in this field. It is a big business and is important to our country. It means jobs; it is a significant force in our economy; it is a major, positive factor in U.S. foreign trade; and it provides exceptional public transportation and military service. I believe, and I am sure you believe, that aeronautics will continue to play an important part in the future of our society.

"The following facts attest to its importance to our country. In 1973, the aviation industry was responsible for producing about $12 billion in military and civil hardware sales, of which about $7 billion were for civil aircraft and engines. Of this, $3.8 billion were in exports of transport aircraft and related equipment. This represents about a fivefold increase in civil export business in a 10-year period. Total exports of the aerospace industry, which includes both civil and military products, is expected

COVER

Scale-model of the Space Shuttle Orbiter, basic element in a new, low-cost system of travel to and from Earth. It can be reused every two weeks.

to reach $7 billion in 1974. The importance of this figure to our balance of payments is self-evident. Today U.S. designed and produced transport aircraft form about 80 percent of the world air transport fleets (excluding the Red-bloc countries). Because aviation products represent a major, positive factor in the U.S. economy and in the balance of trade, we can say that aeronautics is a 'winner'—let's keep it that way.

"To further attest to the importance of aviation, prime aircraft production plus the airline industry employed some 700,000 persons and grossed over $20 billion this past year.

Importance of Airplane

"A measure of the airplane's importance to transportation is the fact that, domestically, aircraft provide three times the revenue passenger miles of all other public transportation modes combined. The near-term growth of civil demand for air transportation has been estimated at about 6 percent per year. In this country alone in 1973, some 183 million people flew about 126 billion passenger miles. For 1973, air freight and mail, respectively,were assessed to be 2.4 million ton miles and 660 thousand ton miles. Projections for freight and mail show growth rates even higher than for passengers.

"Throughout the world it is estimated that 480 million people flew 380 billion passenger miles in 1973 and the volume of air cargo was greater than 12 billion ton miles.

"Military aviation, too, must be factored into our planning for the future. Nearly half of our foreign and domestic volume of aviation business is for military equipment. We must recognize and deal realistically with the military aviation business from national defense and from international trade considerations. Whether we like it or not, military equipment is a tool of international diplomacy, a deterrent to aggression.

"Clearly, aeronautics is a real force in our society. It is surely one of the most significant areas of technological advancement in this century. It has directly and indirectly enhanced our way of life, our technical posture and the value of our goods on the international market. There is a real need to preserve our position in aeronautics.

But while the need is clear, there is also a very real danger that we will not meet this need. The danger comes from the fact that fewer and fewer young people are entering the field of aeronautics. Let me just give you one set of numbers: in 1968, 3,200 students were enrolled in junior classes in aerospace engineering; in 1973—in the class that will be graduating next June—there were 800.

Challenges Exist

"Obviously our young people are not now challenged by a career in aeronautics. But there are challenges—challenges which stem from the growth in demand for service, from operational, economic, and environmental factors, and from the need for judicious use of our natural resources. Social, economic, and competitive forces—and the state-of-the-art itself—have resulted in highly optimized and very expensive aeronautical systems.

"The number of man hours for design and development, the amounts of materials, the complexity of production and test combined with worldwide inflation have driven the costs of new aircraft development to very high levels. As a result, for the military there are fewer developments, and the financing of new civil aircraft developments has become very difficult. Fewer military aircraft developments coupled with divergent military and civil system requirements have reduced the flow of military technology to the civil sector. Thus, the civil sector will have to look after its own research, technology, and development interests to a much greater degree than in the past.

"These factors singly and in combination form a formidable, but I believe solvable, set of problems. I find them a great challenge. You must, too, or you would not be part of these proceedings.

"Our position of leadership in aeronautics has evolved over a 50-year period through a dedicated industry/government/university partnership. The partnership is complex, involving education, research, technology, development, manufacturing, sales, operations, and service.

The changing nature of our internal and external national affairs has imposed stresses and changes in this vital partnership. An examination of the changing circumstances will help us assess how the partners (industry, government and universities) have been affected and what we need to do to maintain aeronautics as a positive force in our society.

Changes are Clear

"From an industrial standpoint, the changes are very clear. As I have noted, aircraft are more complex and costly in time, manpower, and money to develop. Because of the soundness of designs and the increased cost of replacement aircraft, current operational aircraft likely will be in service for times considerably greater than anticipated. Thus, we can expect to see derivatives of basic designs for the near-term future. This has led some people to refer to the coming decade as the 'decade of the derivative.'

"Another change we must factor into our planning is that there will be a reduction in the number of military developments in future years. There is little reason to believe that this situation will change. The technology support that civil systems enjoyed in the 1950s and 1960s, as a result of military programs, is thus decreasing and is projected to decrease further because of costs for new developments and divergent design requirements. For example, future civil systems will have a different sensitivity to environmental factors, fuel conservation, and passenger service and safety.

"An important additional consideration is foreign competition. It is becoming more intense. The Western Europeans, Russians, and others, directly supported by their respective governments, are building more and more extremely well engineered and sophisticated aircraft. We have current examples of this. There is active competition between the European A-300 wide-body transport and our wide-body transports and between foreign and U.S. aircraft for the short-haul markets. There is an extremely active and important competition between the French lightweight fighter and the lightweight fighters of General Dynamics and Northrop Companies. Future market potential for this class of aircraft makes it a multi-billion-dollar program.

Other Factors Involved

"Competition is not the only factor that has forced technological change in the commercial field. The slow awakening to social and economic needs has had significant impact. We must show a special awareness to environmental factors, noise and pollution. We must be concerned about the safety, use of resources and the adequacy of our service. Congestion of the airways and airports, all weather operations, collision avoidance, and crash safety are some of the specific concerns we must deal with effectively.

"These factors, system complexity, high costs, financing, and competition combined with the world's economic posture, have caused considerable economic stress within the industry—stress that threatens the existence of several large industrial groups. Thus, it does not appear that we will be able to rely on industry for investments from their private funds, for activity other than that associated with growth versions of products or with the development and marketing of near-term new products having low technology risk. Yet, because of competition from foreign sources and the demand for solutions to complex social and economic problems, future aeronautical systems, to be acceptable and competitive in the open market, must incorporate the products of high risk and costly technology.

"It is clear that support of the research and technology critical to the future health of civil aeronautics will depend on heavier government involvement. However, the role of industry remains paramount in the design, development, and production of civil aircraft, and promotion and operation of civil air transportation; and the design, development, and production of military aircraft.

"The government's role in aeronautics has been, and I strongly believe, should continue to be the sponsorship and conduct of basic research and advanced technology programs for civil and military aviation, and the specification, development, procurement and operation of military aircraft. For civil aircraft, it is appropriate and essential that the government pursue selective significant technology to the point where the major risk for full industrial development has been reduced to some reasonable level. In addition, the government must retain the responsibility for civil air transportation policy, rules, regulation, and airway operation.

"I do not foresee any change in these basic roles for industry and government. NASA will continue to play its unique role in aviation research and technology. It is committed to advancing our aeronautical state of knowledge through the provision of research and advanced technology to help us preserve a position of world leadership.

NASA Will Assist

"This position of leadership cannot be preserved in the face of aggressive foreign competition without advances in technology related to safety, efficiency, performance, and the environment. NASA will do its share. We will work on low-cost aircraft concepts, reducing energy requirements, reducing environmental impact; and we will continue to work on safety, aerodynamic and propulsion performance, and operations technology.

"We will enhance our military support with special attention to work of value to civil aviation, and continue our support of university research with special consideration to assisting the university community in their roles of education and research in aeronautics.

"More specifically, in the next five years we in NASA plan to give special attention to the following matters:

"1. Engine and aircraft technology, tending to designs that conserve energy and provide effective service.

"2. Technology to utilize fuels such as hydrogen, in order to reduce reliance on petroleum-based fuels.

"3. The technology required to design environmentally acceptable aircraft from noise and pollution considerations.

"4. Advanced avionic systems for both navigation and aircraft flight control to improve safety, comfort, and reduce congestion.

"5. Low-weight, high-strength, non-strategic structural materials and design methods, to reduce the demand for expensive, energy intensive short supply materials and to reduce weight and improve operating efficiencies of engines and aircraft.

"6. Close cooperation, including joint programs, with the Department of Defense to enhance both our military posture and the general state of knowledge for civil applications.

Aeronautics Support Increased

"NASA, through the years, has worked closely with the university community on training programs, grants for research and facilities, and contracts for research and technology. In fiscal year 1972, our university program totaled some 1,600 grants and contracts with a value of some $100 million. Of this, about 200 grants and contracts, with a value of about $10 million, were in aeronautics. We have been slowly increasing our support in aeronautics. This trend will continue. We propose to assess what we have done in this arena and examine ways and means to further the productivity of this core activity.

"We in NASA have not stopped examining the way we do business. Two matters currently are of particular concern to us: a good insight into the future scope and direction of our aeronautical activity to help focus program decisions for the next four to five years, and an examination of the way we conduct our affairs with a view toward strengthening our university and industry relationships.

"To assist us in developing our future program, we have organized a government long-range study group to evaluate the 'Outlook for Aeronautics' in the 1980-2000 time period. This study group has been working with industry representatives to gain as much insight as possible into this complex question. A report will be developed which we believe will provide all of us with a thoughtful document that will assist in building our future aeronautics program. This report should be available in the summer of 1975.

"I have noted that our success in aeronautics can be traced to a strong, unique aeronautical research and technology capability that resulted from a productive industry/government/university working relationship. There is an inherent danger in taking this relationship for granted. We propose to pursue the matter of strengthening our relationships with the universities, industry, and other government agencies through special discussions. We have a start on the process at this conference. I invite your comments on the government's and NASA's future role in aeronautics and on ways to strengthen NASA's relationship with all of you in industry, government, and the universities in your roundtable discussions.

Trend Must Be Reversed

"The basic strength of our aeronautics activity stems from a strong science and engineering educational base. As I said earlier, the fact that university enrollments in the engineering arts and sciences have been declining is a matter of serious concern. This trend needs to be sharply reversed.

"The future of aviation in this country depends on maintaining a high quality university program which will attract and educate the individuals who will be the aeronautical researchers, designers and developers of the future, and who will perform the high-level basic research that forms the very foundation of our complex aeronautical technology. This is vital to the future health of our aeronautics activity. Government and industry cannot move forward without good people. This job rests on the shoulders of all of us—the university community, government, and industry. Success will help ensure that aviation remains a vital productive part of our economy and society.

"To be successful in bringing the right kinds and numbers of bright, imaginative, productive young people into the field, we must communicate to the new student that there is work to be done of social and economic significance which can impact in a positive way our quality of life; that the work is challenging and rewarding; that there are jobs and a future in the broad field of aeronautics; and that special talents are needed to sustain our position of world leadership in aeronautics. Clearly, the first step is to establish credible goals and to convince the prospective student that these goals are worth the investment of their time and the dedication of their lives.

"Let me propose one such goal: to provide the technology needed to produce aircraft fuel savings of 50 percent within the next 20 years. Since jet fuel today amounts to 8 percent of the United States petroleum consumption, and will amount to 12-15 percent by 1985, a 50 percent reduction in aviation fuel usage is a most worthy objective.

"I am convinced that the goal can be reached. It will require work on advanced materials and compo-

site structures to reduce weight; on avionic systems such as fly-by-wire and active controls for further weight reductions; on 'supercritical' aerodynamics and boundary layer control to reduce drag; on advanced engine cycles to reduce fuel consumption; and on operational techniques to reduce air traffic delays.

What NASA Is Doing

"NASA today is working in all of these areas, and many more. We are working on airfoils and wing fuselage combinations that will significantly increase the efficiency of aircraft; on new aircraft concepts for improved high density short-haul transportation; on quieter, cleaner, more efficient engines; on new kinds of fuels and engines so that we may not have to depend on hydrocarbon-based fuels; on new materials and structural concepts for more efficient design; and, of course, on the technology that will support the development of practical supersonic air transportation.

"A combination of talents and capabilities in the field of research, technology, engineering, marketing, and finance to remain competitive in aeronautics will continue to be necessary. But, of fundamental importance is the need for a sound research and technology base. Without the new young people, the better ideas, and the better designs and techniques for implementation and production, we will not be able to remain successful in competing with other countries.

"In summary then, I believe that we have challenging times ahead. We have and will experience in the future intensified competition from overseas. Military programs can be expected to reduce in number and in their technical contribution to civil aviation. In large part, civil aviation will be expected to support its own research and technology needs. But its ability to borrow or attract needed capital will prove difficult. Therefore, an aggressive government research and technology program is important to the continued health of our aeronautical activity. NASA is prepared to make an important contribution in this direction.***"

Methods of producing electric power from coal are being assessed by a NASA-industrial team in an 11-month study now underway at Lewis Research Center. The program is jointly funded by the National Science Foundation, the Department of Interior's Office of Coal Research, and NASA.

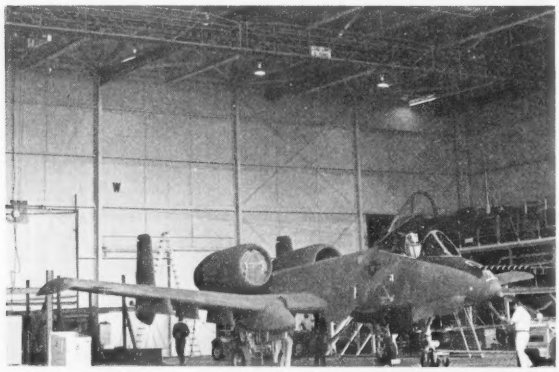
The National Oceanic and Atmospheric Administration's Hurricane Center in Miami, FL, has been augmented by NASA's new Synchronous Meteorological Satellite-1 (SMS-1), launched May 17 and used in conjunction with Applications Technology Satellite-3 (ATS-3), launched in 1967, and with polar-orbiting NOAA and nimbus space craft.

"'There is no way a major hurricane or severe storm can strike the United States undetected," says Dr. Neil L. Frank, Director of the Center.

Spacecraft such as the SMS and the ATS, in synchronous orbit at an altitude of 36,000 kilometers (22,300 miles), scan the whole Western Hemisphere every 30 minutes.

How fast is 106,000 miles an hour? Faster than a speeding bullet—a whole lot faster.

That's how fast Pioneer 11 will be going as it zips past Jupiter on Dec. 2 and boomerangs back across the Solar System toward Saturn.



NEW SUPPORT AIRCRAFT — Spin-chute tests were conducted recently at the Flight Research Center's Loads Laboratory on the A-10, the new close air support aircraft for the USAF. Thirty thousand pounds of force were applied to the spin-chute attachment point and the release mechanism was checked for proper operation.

BACK FROM SPACE — This control and payload section of a NASA rocket was recently recovered at the White Sands Missile Range in New Mexico after a 320-kilometer (200-mile) trip into space. It will be refurbished and used for further studies of the Sun.

MONTHLY NASA HIGHLIGHTS

MARINER 10 COMPLETES SECOND MERCURY FLYBY

The Mariner 10 spacecraft successfully encountered Mercury for a second time on Sept. 21, 1974, sending back some 500 TV pictures. This second encounter extended the photographic coverage of the sun-side of Mercury and provided new views of the south polar cap area.

The Mariner 10 spacecraft was launched Nov. 3, 1973, from Cape Canaveral on the first dual-planet mission to Venus and Mercury. This spacecraft, with a basic flight operations time of five months, was the first designed to use the gravitational attraction of one planet to reach another. During the flight to Venus, planetary and interplanetary data was radioed to Earth, including TV picture mosaics of the Earth and Moon.

It encountered Venus on Feb. 5, 1974, and returned excellent TV pictures and other scientific data. On March 29, 1974, the spacecraft encountered the planet Mercury, transmitting approximately 1,700 outstanding TV pictures and successfully obtaining measurements of Mercury's environment, atmosphere, surface, and body characteristics. The mission was judged successful in April, 1974.

The opportunity for a second encounter with Mercury was recognized in an early study of the planet's period around the Sun in relation to the expected trajectory of the Mariner spacecraft. On July 2, 1974, a trajectory correction maneuver was performed to provide a more favorable second passage in terms of science data return. This maneuver also placed Mariner 10 on a trajectory that will provide a third encounter with Mercury. The spacecraft is now in a "solar sailing" mode with its solar panels and High Gain Antenna configured to use solar photon pressure to minimize the activation of the attitude control jets. If the gas conservation efforts are continued and no inflight problems occur, the prognosis for a third Mercury encounter on March 16, 1975, appears favorable.

FIRST DETAILED PHOTO-MAP OF MERCURY PUBLISHED

The first photo mosaic map of the planet Mercury, prepared from television pictures taken by the Mariner 10 spacecraft last March, has been published by the U.S. Geological Survey. The 23-by-26-inch map, prepared at a scale of one inch to 160 miles, covers the entire sunlit portion of the planet, an area of about 12 million square miles. The map clearly shows many of the prominent craters, long linear scarps and plains that were revealed in the Mariner photographs. As a result of the Mariner data, scientists recognize that the geology of Mercury is much more complex than imagined. The planet differs in distinct ways from the planets examined thus far in NASA's program of planetary exploration, and seems to represent a unique stage of planetary evolution. The photographs taken on Mariner's second Mercury encounter in September, 1974, will be used to enhance the resolution and quality of the mapping.

ITALIAN CREW LAUNCHES UNITED KINGDOM SATELLITE

The UK-5, a United Kingdom X-ray satellite carried aboard a NASA Scout rocket, was launched by a team of Italian engineers on Oct. 15, 1974, from the San Marco launch platform off the coast of Kenya. This was the seventh launch from the San Marco facility, but the first time it has been used to launch a satellite for a country other than the United States or Italy. The UK-5 is the fifth in a cooperative program between the Science Research Council of the United Kingdom and NASA, designated as the Ariel series. The spacecraft is in a near-circular, near-equatorial orbit with an expected operating lifetime of one year. Six X-ray experiments are aboard, five from the UK and one from the U.S., to conduct a detailed study of X-ray sources both within and beyond our galaxy.

X-ray astronomy became a science in its own right in 1962 with the discovery of the first non-solar X-ray source in space. Since then about 200 X-ray sources have been catalogued. X-ray astronomers also have found evidence for the existence of a "black hole" companion to a faintly luminous star, Cygnus X-1. Theorists had predicted earlier that certain stars could collapse to an extremely dense state with a powerful gravitational field — a so-called "black hole." This field is so strong that no object, not even light, can escape from the star. The presence of the "black hole" is indirectly revealed when it is part of a binary star system (two stars revolving around each other) and when matter, continuously drawn from the other star, is accelerated and emits X-rays as it proceeds toward the "black hole."

Because of its constant viewing capability, the Ariel 5 will permit scientists to record X-ray source

variability as well as new transient X-ray sources which appear, turn bright, and disappear within relatively short periods of months. When correlated with radio and optical astronomy findings, the data will give astronomers new insight into the mysteries of the high energy phenomena of our galaxy and those which govern the principal physical processes of the universe.

SECOND WESTERN UNION SATELLITE LAUNCHED

The Westar II, second in a series of communications satellites of the Western Union Telegraph Co., was launched successfully from Kennedy Space Center on Oct. 10, 1974. The satellite is being drifted towards its final geosynchronous station over the Pacific Ocean south of Los Angeles. After checkout, Westar II will join Westar I in the transmission of data, telephone messages, and commercial TV programs for Western Union and its customers. Westar I, launched April 13 into geosynchronous orbit over the Pacific Ocean near the Galapagos Islands, made America's first mail delivery by satellite on Sept. 5 when messages, called Mailgrams, were sent via the satellite from New York and received in Los Angeles. Mailgrams are letters which are normally sent over Western Union's ground network and delivered by post offices for one-day mail service. Mail by satellite has been a much-discussed, dreamed-of possibility for years. It offers one of the most reliable, efficient, and economical methods yet developed for moving the mail..

SPACELAB BIOMEDICAL TEST

Astronaut-physician Dr. Story Musgrave and Dr. Dennis R. Morrison of Johnson Space Center's Bioscience Payloads Office recently ended a mockup Spacelab seven-day shakedown test of operational procedures and experiment demonstrations.

Drs. Musgrave and Morrison lived in a mobile home adjacent to the laboratory during Spacelab off-duty hours. Test directors, the science manager and data managers monitored the simulation from consoles in the laboratory near the Spacelab mockup.

This first of a series of tests served as a rehearsal for future tests and as a means of perfecting operational procedures. Other tests included data handling techniques, man-machine integration concepts and a group of biomedical demonstrations that are possible forerunners of actual Spacelab medical experiments. The payload simulation included 12 biomedical demonstrations which were representative of the type of experiments likely to be flown aboard the space station.

The Life Sciences Payload Facility, which is located in what was once the Lunar Receiving Laboratory, will be the scene of a series of Space Shuttle life sciences experiment development tests from now until Spacelab and Space Shuttle are ready for orbital flight.

SERT II ION ENGINE RESTARTED AFTER FOUR YEARS

An experimental electric rocket engine that shut down in orbit in October, 1970, because of a short circuit has been restarted in space. The satellite, called SERT for Space Electric Rocket Test, was launched in February, 1970, to demonstrate the feasibility of electric propulsion for long duration space missions. Engineers believe the short circuit was caused by a sliver of molybdenum which was detached by erosion and became lodged in the thruster's grid. Apparently, the sliver was jarred loose when ground controllers triggered the cold gas thruster system to obtain a better Sun angle for SERT's solar arrays.

Scientists decided to realign the spacecraft in order to provide power for testing the hollow cathodes in the SERT thrusters. The engine was turned on "as a shot in the dark." Since the engine was restarted August 20, it has been operated several times for short periods. The two thrusters on the SERT were to operate for a period of six months, but achieved three and five months, respectively, when the short circuit occurred.

LEWIS TO MANAGE ENERGY CONVERSION STUDY

Lewis Research Center will manage contracts with Westinghouse Corp. and General Electric Co. and conduct in-house research to provide an assessment of methods of producing electric power from coal. The 11-month study is jointly funded by the National Science Foundation, Department of Interior's Office of Coal Research, and NASA. Development and operating costs and the impact on the environment will be compared for a variety of systems using coal or coal-derived fuels. Results of the study will form a basis by which government and industry can determine which energy systems are most promising for further development. A Utility Panel with membership drawn from power companies and a Technical Advisory Panel of government experts will review progress of the study and

report to the Steering Committee, consisting of Science Foundation, Department of Interior, and NASA representatives.

BLACK SCIENTIFIC AND ENGINEERING CAREERS

A symposium on Blacks in Science and Engineering, sponsored by the Cleveland Chapter of the National Technical Association, Inc., was held in Cleveland Oct. 10-11.

Several of the nation's leading black professionals joined NASA Headquarters and Center professional personnel for this symposium to discuss problems unique to minorities entering the scientific field. The varying roles of educational institutions, industry, and the Federal Government in providing meaningful professional employment opportunities to black professionals and technicians were focal points for discussion.

The National Technical Association is an organization dedicated to the encouragement and assistance of minority youths to pursue scientific careers. The President of the Cleveland Chapter is Dr. Julian M. Earls of the Lewis Research Center.

STUDY GRANT TO TENNESSEE STATE UNIVERSITY

Marshall Space Flight Center has awarded Tennessee State University, a predominantly black institution in Nashville, TN, a one-year research grant to develop signal analysis techniques for reliable detection of any impending failure of mechanical equipment. The program offers possible applications to the space program, particularly in the maintenance of vehicles involved in manned space flight where safety requirements are critical. The study will be conducted primarily at Tennessee State; however, Vanderbilt University Laboratory's specialized equipment will be utilized. J. Richard Houton, Assistant Professor of State's Mechanical Engineering Department and principal investigator for the study, is involved in research on the acoustic emission signals generated by space hardware.

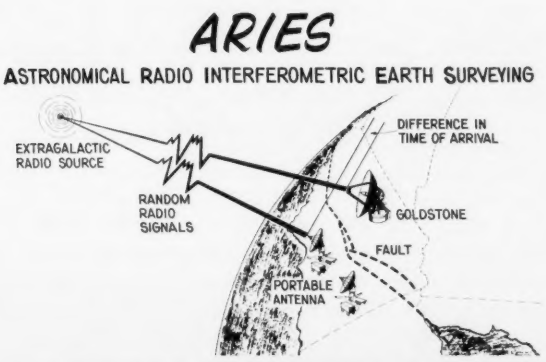
JPL TEAM EMPLOYS RADIO TO PREDICT EARTHQUAKES

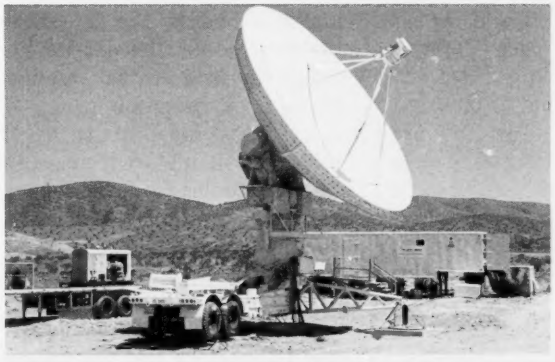
System Will Use Signals From Quasars to Monitor Earth's Crust

Scientists at the Jet Propulsion Laboratory are attempting to use the most distant objects in the Universe to predict the occurrence of earthquakes. Project Aries (for Astronomical Radio Interferometric Earth Surveying) is using signals from radio telescopes "listening" to quasars to measure the movement of the Earth's crust.

According to Peter MacDoran, head of the JPL team, recent research seems to indicate that the Earth's crust undergoes some degree of shifting before an earthquake occurs. This movement can encompass an area of hundreds of square miles. Preliminary checks imply that the less swelling, the smaller the earthquake — but the sooner it occurs. To this date, a major impediment in testing this theory has been the fact that this swelling even in extreme cases, rarely exceeds two or three feet.

However, the integration of several branches of science has led to a possible way of measuring this





ON THE TRACK OF EARTHQUAKES - The artist's drawing at left gives an overall view of the system worked out at JPL for using quasar signals to predict when earthquakes will occur. At right is the portable antenna being used to return measurements from several sites in the Southwest.

swell. Quasars emit radio waves similar to those used in a table radio, but much weaker. These signals can be received by radio telescopes pointed in the proper direction. If two radio telescopes are at different positions on the Earth, though, the signals will be received at slightly different times. These differences are usually about one-tenth of a billionth of a second (0.0000000001 second), but can be measured by atomic clocks, If the Earth's crust moves, the two radio telescopes will move with it — and change the distance between the two stations. This will cause a change in the time difference in receiving the signals.

Since the quasars are far enough away to be thought of as fixed in position, any time variations are certain to be due to the crust's movement, and not the quasar's. Because of this stability, movement of as little as 2 cm (0.8 inch) will soon be measurable. These shifts, incidentally, are able to be measured in three dimensions.

The two telescopes presently being used at the NASA/JPL Deep Space Network telescope at Goldstone, CA, and a portable 9 m (30-foot) antenna at JPL in Pasadena. The portable telescope is on the other side of the San Andreas Fault from Goldstone and will provide information on shifts of that fault.

The portable antenna also will stop at several other spots in the Southwest, including Table Mountain, the University of California at Riverside, and a site in Nevada. In this way, a "grid" of sites will be checked, so as to give the best information on the entire area's shifts. Measurements will be repeated at least once a year, to help make changes apparent quickly.

Preliminary testing of the equipment indicates that the setup is working perfectly.

MSFC CONSOLIDATES TESTS

Facilities are being modified at the Marshall Space Flight Center to consolidate Concept Verification Test (CVT) simulation in a central location and to improve the entire CVT operation.

The CVT project is a NASA-wide effort that will determine by actual testing in simulators if concepts generated during definition studies for future space activities are valid before commitments are made to proceed with final design and hardware fabrication. Large monetary savings are anticipated as a result of this early activity.

The modifications are necessary to accommodate CVT's General Purpose Laboratory and the future installation of higher fidelity simulators, such as the Spacelab Simulator and Shuttle Interface Simulator. Emphasis is given to experiments that will be performed in the Spacelab now being developed by the European Space Research Organization (ESRO) as a payload carrier for early Space Shuttle missions.

NEW FEATURE IN STAR

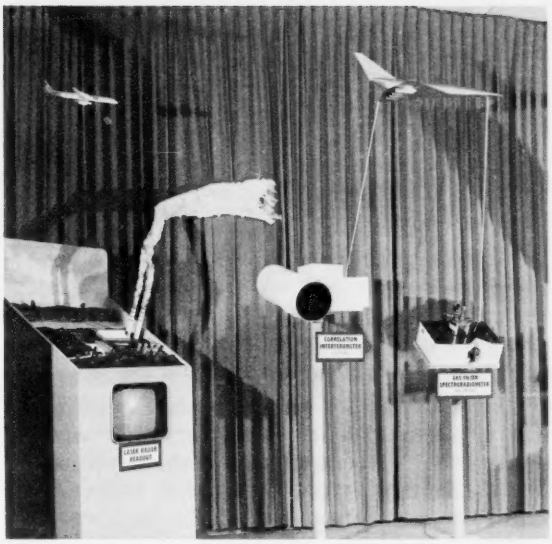
A new feature providing coverage of recent and on-going aerospace-related research projects has recently been incorporated by NASA's Scientific and Technical Information Office in its semimonthly abstract journal, *STAR* (Scientific and Technical Aerospace Reports).

Previously, a substantial time lag frequently existed between the award of a research grant or contract and the issuance of technical reports, journal articles, or conference papers pertaining to the progress and results of the investigation. To enable the users of *STAR* to learn of on-going research of aerospace interest, NASA, in cooperation with the Smithsonian Science Information Exchange, has inserted a separate section of such information in each issue of the publication, beginning with the August 23, 1974, issue. Each insert consists of 100-200 summaries of non-NASA sponsored research projects, together with 50-100 titles of NASA grants and university contracts initiated in FY 1974 or later.

About 2,000 active NASA grants, university contracts, and summary portions of recently updated NASA RTOPS (Research and Technology Operating Plans) will be announced annually. In addition, about 3,000 non-NASA new or continuing research projects selected by the Smithsoniian Science Information Exchange from information supplied to it by cooperating Government agencies and other organizations will be presented.

The purpose of the insert is to assure current awareness, thus minimizing duplication of research effort, and also to enable NASA users to contact directly those researchers who can provide information on the work they have underway.

A supplemental agreement totaling approximately $16.5 million has been signed between NASA and the Space Division of Rockwell International Corp., Downey, CA, for additional work for the development of the Space Shuttle Orbiter and integration of all elements of the Space Shuttle System.



TECHNOLOGY FOR MAN—Audiences at Langley Research Center's recent Special Review sat inside a wide-body jet transport, as shown on the left, to hear the presentation on Technology for Safer Aircraft. At right is one of the displays illustrating methods for preserving the Earth's atmosphere.

TECHNOLOGY REVIEW AT LaRC ATTENDED BY 11,000 PERSONS

10 Demonstrations Are Included, With Emphasis Chiefly on Aeronautics

"Technology in the Service of Man," NASA's collective term for its programs, was converted into sound and into visual images in 10 presentations outlining major research in aeronatuics, space technology, energy resources and environmental protection at Langley Research Center's recent week-long Special Review.

In writing of the program, a national magazine reported that "gloss and Rockette-like precision characterized" the demonstrations.

Guests included members of Congress, aeronautics and aerospace industry leaders, educators, military representatives, and Federal, state and local government officials. They were welcomed to the first day of the review by Dr. George M. Low, NASA Deputy Administrator, who reminded them that Langley is the oldest U.S. aeronautical research laboratory and is still one of the foremost in the world.

While the review covered the broad field of NASA's activities, emphasis was on aeronautics and its future. Space technology was confined chiefly to the Viking 1976 Mars landing mission, highlighted by a full-scale model of the Lander, and to procedures now used to monitor the environment. Each of the presentations featured teams of speakers, as well a multi-media programs that included films, slides, and special displays.

A very area beside LaRC's main hanger was covered with displays and exhibits from all of NASA's centers. This phase of the program, titled "Benefits from Space," reviewed the field of Technology Utilization.

One of the most outstanding demonstrations, concerned with Quieter Aircraft Communities, took place in Langley's new Aircraft Noise Reduction Laboratory. Audiences experienced stimulated overhead flights by several kinds of aircraft. Multiple speakers produced a three-dimensional illusion. Tape recordings simulated planes and helicopters overhead at real-life volume. Visitors were permitted to vote on the comparative intensity of sounds by means of buttons on the arms of their chairs. Results were made known after each vote.

Cutting Hardware Nosies

As exhibited, NASA is concentrating on noises caused by airplane hardware as well as those caused by engines. Scientists, it was shown, hope eventually to reduce aircraft noise to the level of other community noises. A model of the plane of the future was described by one of the speakers as purring "like an electric golf cart."

Much attention was devoted to technology to reduce aircraft fuel consumption. Exhibits indicated that the jet transport of 1985 may use 35 percent less fuel than those of today. The supercritical wing may save 10–15 percent. Composite materials improvements and their

application in aircraft structures may bring a reduction of another 10–15 percent, and winglets, an additional 3.5 percent. In addition, technology to reduce engine size and weight and increase efficiency may result in a fuel consumption decrease of 15 percent or more. A more radical departure from conventional design, span distributed loading, was projected to produce fuel savings of up to 55 percent.

One model with span-distributed load had the engines spaced indivually along th top of the wing, and carried three fuselages beneath the wing. The center fuselage was for passengers and the others were for carrying fuel, perhaps liquid hydrogen.

Other exhibits were desigend to show that light aircraft of the future will be safer. In order to permit easier recovery from spin, LaRC has tested various tail designs in its vertical spin tunnel, on free-flying radio-controlled models, and on full-scale planes.

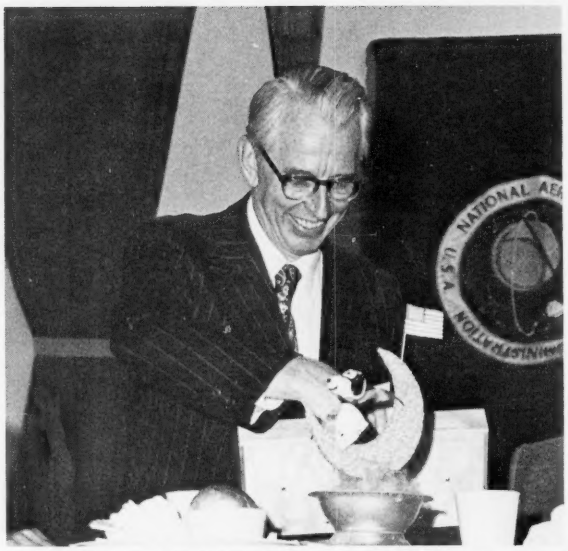
Light aircraft flying behind the transport of the future will be safer and terminal congestion will be reduced because of research efforts to alleviate wingtip vortices, or wake turbulence. Recent progress includes the discovery that a change in the flap setting on a 747 alters the trailing vortices in such a way that the vortices diffuse much more rapidly.

Weather No Deterrent

Weather was another phase of aircraft safety covered in demonstrations. As a step toward all weather operations in the future, a Boeing 737 aircraft has been equipped for completely automated flight from takeoff to landing, all controlled by computer. Transports of the future will not be deterred by the elements. They will fly on reliable schedules, fly closer to one another, and land at shorter intervals to increase airport capacity.

The presentation of Technology for Safer Aircraft was made inside a mockup of a commercial, wide-body jet transport. Audiences sat in airline seats in a simulated passenger cabin as they heard talks and saw films describing NASA's efforts to improve aircraft safety.

In a letter to Dr. Edger M. Cortright, Director of LaRC, following the Special Review, Dr. Low stated: "It was a superb performance by everyone and in every way. The one element of the tour, above all others, that was most outstanding to me was the speakers . . . the men and women who demonstrated so well that NASA is still the best high technology agency in the world, and that they personally are excited about being part of it."



FLETCHER RECEIVES GIFT—The Antelope Board of Trade in California presented Dr. James C. Fletcher, NASA Administrator, with a replica of Leonardo de Vinci's Ornithoptor. He is shown examining it.

DR. FLETCHER DISCUSSES WHAT THE FUTURE HOLDS FOR SPACE

Reveals Shuttle Test Plans and Hope to Reconvert Solar Energy from Orbit

To the posed question of "Where do we go from here in space?", Dr. James C. Fletcher, NASA Administrator, in a recent address before the Antelope Valley Board of Trade at Lancaster, CA, summed up his answer in these few all-encompassing words:

"We are going the Shuttle route for benefits from Earth orbit, and we are going to explore the Solar System with automated spacecraft, and then eventually to extend man's habitat to the entire Solar System."

Speaking in the locality where the Space Shuttle Orbiter is being developed, he said it was appropriate that he answer the question there "because to a very large extent America's future in space, and the future of the world in space, is being shaped here in the Antelope Valley."

The future was depicted by him only in terms of optimism. He reported that Congress and the White House have supported the space program in such a way that the funding for FY 75 and for the following years assures the opportunity to test the Shuttle Orbiter in horizontal flight in 1977, to fly it in orbit in 1979, and to begin operations with it in 1980.

"As you know," he said, "we plan to make the first horizontal flight tests of the Shuttle Orbiter launched from a Boeing 747 at NASA's Flight Research Center at Edwards. In addition, we plan to utilize Edwards as a secondary landing site for operational Shuttle flights when weather or other considerations make it desirable.

"We also plan to land the first few Shuttle orbital test flights at Edwards for the added safety margins and good weather conditions during the initial test flights. To have the Orbiter return to Antelope Valley for a landing after its first flight in space is quite appropriate.

"The Space Shuttle will come in time to have various landing sites. But you can always be proud of the fact that this technological marvel of our time — the first true aerospace vehicle — was built and first flown in the Antelope Valley."

Shuttle Opens Way

He described the Shuttle as the key to further space progress, the key to American leadership in space, and the key to a treasure chest of scientific and practical benefits to be won from space in the decades ahead.

"It took foresight and courage on the part of the President and the Congress to make this long-range commitment to Shuttle development," he added. "But as I see it, we had no other choice. If we had not decided to build the Shuttle, the answer to your question, 'Where do we go from here in space?', would have been a simple one: Probably nowhere."

Reminding that the Shuttle blueprints are now being turned into hardware at Palmdale and elsewhere, Dr. Fletcher said the nation has a dynamic, wide-ranging, and highly-productive space effort underway for this decade, and exciting plans for the future.

"We cannot do everything we would like to do at this time," he said, "but we can continue taking the logical next steps in all the important directions. And we can do this on a stabilized annual budget of around $3 billion per year, including several hundred million for aeronautical R&D."

Challenges and Directions

He listed the following as the main challenges set and the main directions in which the space program is moving:

1. Bring the Space Shuttle into operation by 1980.
2. Develop productive new payloads for the Space Shuttle to win practical benefits and new understanding of the Universe.
3. Continue our highly successful efforts to explore throughout the Solar System with automated spacecraft.
4. Use our space capabilities and experience to help solve some of the pressing problems we face today right here on Earth.
5. Develop the new technology for more productive and more far-ranging space missions in the future.

He gave these as a "few quick examples of what we are doing and can do":

"Example 1: In 1976 we will soft land two sophisticated automated laboratories on the surface of Mars in an effort to obtain evidence of life elsewhere in the Solar System.

"If we find such evidence, it will of course have profound impact on the origin of life in our own Solar System and on the thinking of mankind.

"Even if the search for life on Mars in the Viking program is inconclusive, the engineering problems involved and their solutions (or perhaps at this stage I should say their intended solutions) will undoubtedly stir widespread interest among engineers and laymen alike.

"Actually, most of the engineering work on Viking has been completed, but it is only when our automated spacecraft reach the scene of action that the dramatic story of challenge and response will begin to unfold for the public.

"Viking is our most ambitious effort to explore the planets in this decade. In many ways, the engineering problems to be overcome are comparable in difficulty to those we solved in the Apollo missions to the Moon.

Advances in Technology

"Of course, we do not have the problems of life support for men on the Viking mission, but the absence of astronauts makes successful operation of the life-detection laboratory experiments all the more difficult. So I think that in 1976 you are going to see evidence of broad advances in the technology of Solar System exploration, and, beyond that, in the general field of automation for possibly other applications in our society.

"Consider the effort it has taken to make automated instruments, which are necessary for meaningful life detection experiments, fit into a small cube-shaped package only one foot on a side, and to hold the weight of all these instruments down to about 36 pounds.

"The life detecting instruments that have been re-designed to fit into one cubic foot of space aboard the Viking Lander would ordinarily weigh

thousands of pounds and occupy several rooms in a college or industrial laboratory on Earth. So you might well say that these instruments have not only been re-designed but almost re-invented.

"This small package, called the Lander Biology Unit, will contain — in its one cubic foot of space — three automated chemical labs, a computer, a number of tiny ovens, counters for radioactive tracers, filters, a sun lamp, a gas chromatograph to identify chemicals, 40 thermostats, 22,000 transistors, 18,000 other electronic parts, and 43 miniature valves.

"One of the Lander Biology experiments involves a Test for Metabolic Activity in which three soil samples will be moistened with a nutrient of organic compounds like sugar which bear trace chemicals. Instruments will monitor the gases given off by the samples over a period of about two weeks.

"If the well-fed soil samples produce a steady flow of gases, this will be taken as evidence that living organisms in the soil consumed the nutrient; a steadily increasing production of gases will be taken as evidence of growth by the organisms.

"These experiments must not only be performed within this tiny package, but their results must be analyzed and reported back to Earth, all automatically.

Viking Performs

"If Viking performs as expected, we will have convincing new evidence of the versatility and productivity of automated spacecraft. And the more we learn from this automatic equipment of the space age, the more ready we will be to send human explorers along with it on future expeditions.

"Viking is only one part of the comprehensive effort we are making to use automated spacecraft to explore throughout the Solar System during the next two decades.

"Example 2: We have a fascinating engineering job to do in developing bigger and better instruments to use in exploring the Universe from Earth orbit. One of these is what we call the Large Space Telescope, which will weigh about 10 tons; we will put it in orbit in the early 1980s, using the new Space Shuttle to launch it, to service it in orbit, and to bring it back to Earth for refurbishing after several years.

"The Large Space Telescope will be in the three-meter, or 10-foot, class. But because it operates in space, above the blanket of the Earth's atmosphere, it should be much more productive, in some fields, than the largest telescopes on Earth.

"The resolution of the LST is impressive. If you had it mounted in Lancaster, and if the Earth were flat, you could see the headlights of a car in Tokyo, and you could tell that the car had two headlights and not just one.

"The LST will enable astronomers to see 10 times farther into space than they can now. It may enable them to see to the edge of the Universe.

"Closer to home, the LST may let us see evidence of planets circling nearby stars, planets that our descendants a hundred years from now may try to visit, planets that we may contact by radio in our own lifetimes.

"The astronomers will use the LST to obtain knowledge. But engineers will use it, and its scientific findings, to vigorously pursue new technology for direct application to the problems of man and his environment. There has been some opposition in Congress to proceeding with the development of the LST in the next fiscal year, as we hope to do, but I see the LST as a classic example of the kind of effort we must make if we want to remain the technology leaders on Earth.

Substitute for Station

"Example 3: When NASA first began thinking about the Space Shuttle, it was thought of as a vehicle to serve a large space station in Earth orbit. But NASA ran into a budgetary dilemma: it didn't seem possible to obtain the funding to build both a large space station and the Space Shuttle in this decade.

"A space station would be of no use without the Shuttle. And at first the reverse also seemed to be true — that a Shuttle would be of little use without a space station to serve. But the more this was studied, the clearer it became that an opportunity, not a dilemma, existed. With some modifications in our Shuttle planning, the Shuttle could be used as a launcher and servicer of automated spacecraft but also as the carrier of a small but highly versatile and highly productive manned space station.

"The Europeans call this manned space station the Spacelab. It has been designed to be lifted in and out of the cargo bay of the Shuttle, which as you probably know is 15 feet in diameter, 60 feet long, and intended for payloads up to 65,000 pounds.

"We built another challenge — or sub-challenge — into the Shuttle effort. We wanted to enlist the cooperation of European nations in a way that would be mutually advantageous and save U.S. dollars. We found the Europeans receptive to the idea of developing the Spacelab, at a cost to them of around $400 million or more, and a corresponding saving to the U.S.

"This is so far the most significant international cooperative space effort ever attempted. I am most

encouraged by the success of our persistent efforts to enlist the cooperation of other industrialized nations in exploring and using space.

New Products and Techniques

"Example 4: This is a challenge to be shared by NASA and private industry. This joint challenge is to demonstrate and use the Shuttle and particularly the Spacelab in the 1980s to produce valuable new products and new techniques.

"NASA has already made a substantial investment in demonstrating the feasibility of space processing in the Skylab program. Additional experiments will be carried out during the Apollo-Soyuz Test Project next July when an American and a Soviet spacecraft rendezvous and dock in Earth orbit. And, of course, the Spacelab is being designed and equipped to facilitiate its use for processing experiments. * * *

"Example 5: NASA is working in a number of ways — independently and in cooperation with other Government agencies — to help find long-range solutions to current energy shortages. One far-out possibility in this field is the gathering of solar energy aboard a spacecraft in synchronous orbit, converting it to microwave, beaming it to a collector station on Earth, and reconverting it to a useful form for the nation's power grid.

"The advantages of using spacecraft to help meet energy needs are obvious, if we can learn how to do it at reasonable cost. The supply of potential power is there for the taking, 24 hours a day, in unlimited quantities, and there would be no pollution.

"We recognize that several very substantial advances in the state of the art must be made before we can begin to build a large-scale space-based solar power system.

"For example, the cost of the solar cells used in Earth orbit to turn sunlight into electricity will have to be greatly reduced (or an alternative method for turning the Sun's heat into electricity will have to be perfected). We are working on that. * * *

In concluding, Dr. Fletcher expressed the hope that he had given some indication of the significant advances to be made along all the major avenues of space progress in this decade and the next.

"Late last year," he told his audience, "we completed a detailed planning study which indicates in great detail the kinds of missions we expect to fly in Earth orbit and throughout the Solar System up through the year 1991. This study is called 'The 1973 NASA Payload Model.' It has been published as part of our Congressional testimony, and copies may be obtained from NASA Headquarters.

"At the present time, we are engaged in two new long-range planning studies called 'Outlook for Space' and 'Outlook for Aeronautics.' These new studies will seek to identify the most rewarding directions we can take in space and aeronautical research and development between now and the year 2000. They will seek to identify not only the most promising or most exciting possibilities, but also those that tie in most closely with our overall national goals and national needs during this time period; that is during the remainder of this century."

FAIR TREATMENT IS SEEN AS AID TO SPACE PROGRAM

Mrs. Harris Urges NASA Employees to Encourage Mutual Respect

Mrs. Ruth Bates Harris, Deputy Assistant Administrator of Public Affairs for Community and Human Relations, is calling on NASA employees to "encourage a wholesome climate of mutual respect."

In an official statement, she points out that, in broadening its own population, NASA will bring in new supporters of its program. Her statement follows:

"NASA is re-assessing its priorities and facing up to the needs and realities of the day. It is examining its policies, practices, procedures, decisions and attitudes to be certain that it demonstrates in every way possible that it is fair and responsive in its treatment to *ALL* people; not only because this is what the national conditions demand, but also because this is the best American way to progress.

"In the past, NASA has not been as conscious as it should have been of many groups that have been historically excluded from the mainstream of national life. Among these are women, blacks, Spanish-speaking, and American Indians. There are other groups that also require special attention such as the American youth, the jobless, the elderly, and the poor.

"In the new policy of 'inclusion,' NASA will be serving national needs and will be undertaking a policy that will widen support for space programs, which presently lack public support. For example, a recent report of the University of Michigan's Institute of Social Research showed that in 1973 only 9

percent of the population favored greater investments in space exploration. More than 60 percent wanted to see space funding cut. A decade ago 26 percent favored more spending for space, while those who favored a decrease numbered little more than 30 percent.

"As NASA broadens the base and variety of its own population, it also brings in new potential supporters of the NASA effort. But as we bring in more women, more minorities, we must also examine our own attitudes to be certain that these new participants are made welcome and are helped to advance under our merit system which, ideally, is unencumbered by such factors as sex, age, race, religion, color, national origin, language, income, class, grade, health and physical fitness, geography or other irrelevant factors.

"Each of us can become a committee of one to promote, foster and encourage a wholesome climate of mutual respect and goodwill among NASA employees, applicants for employment, and between NASA and all of the people in the community it serves. The benefits of space exploration can touch every human activity. We must assure that our benefits reach all humanity. We can demonstrate in myriad ways—posters, displays, pictures, speeches, various publications and materials—that this is true. For example, our elderly and poor represent a variety of languages, races, and religions. Pictures can reflect such diversity.

"Each of us can help NASA to fully integrate its work force from top to bottom by helping locate minorities and women. We should also include those who have the experience that age brings, as well as the handicapped in filling vacancies in those offices, units, committees, boards where they are absent or scarce.

"Each of us should make a conscious effort to use more inclusive words such as humanity instead of 'mankind' and persons instead of 'man'.

"Each of us should join together to make employment at NASA a more positive reflection of good human relations and goodwill. Whether NASA gets the public support it now lacks may very well depend in large measure on how well we succeed in our efforts toward 'inclusion.' "

Fission energy from a nuclear reactor has been converted directly into laser light for the first time in experiments sponsored by NASA and conducted at the Atomic Energy Commission's Los Alamos Scientific Laboratory in New Mexico.

WOMAN'S FUTURE — Congresswoman Griffiths addressing NASA audience on the fate of women.

CONGRESSWOMAN GRIFFITH CHAMPIONS CAUSE OF WOMEN

Tells NASA Group They Will Demand More Economic Pie, Fairer Laws

Congresswoman Martha W. Griffiths of Michigan, now in her ninth term in Congress and long a champion of the Equal Rights Amendment, predicted in a recent talk to the NASA Headquarters Administrator's Colloquium Committee that in the not too distant future most women will work outside their home for 25 years of their lives and will "demand a larger part of the economic pie."

Speaking to an audience of both employees and top management in the fifth of a colloquium series entitled "Profiles of the Future," she used as a topic "The Future Role of Woman" and pointed out that Congress continues to write unequal laws. Among the areas involving inequities cited by her were the pension bill, social security, taxes, domestic relations, and welfare.

But she said more women will enter the political arena in the future and that the laws would reflect the change.

She emphasized that women today need more self-confidence in knowing that they can compete in the business world and that they need to "see life as it really is, not as you read of it in novels."

"We believe, and the law is written," she added, "as if every woman had been born to a rich father, who gave her in marriage to a rich husband, who died and left her wealthy, and with several sons who could have taken care of her anyhow.

"Now, of course, this isn't true. The truth is that many women never marry at all. The truth is that even those who do marry do not marry wealthy men; that they outlive their husbands by about seven years, that in many instances they are left with families to support, either through death of the husband or abandonment of the wife; that life for her is just as real, as earnest, and as unprotected as it is for a man."

In closing, she said: "Sixty percent of all women who work outside their homes today are either single, separated, divorced, widowed, or have husbands who make less that $7,000 a year. The discrimination that goes on against a woman economically and in education is really a discrimination against that woman's family, against her children and her husband * * *

"In my opinion, the law should be made so it applies to every American equally; the opportunity to reach your highest potential should apply to everybody."

CRYSTAL FROM SPACE—President Ford examines a crystal grown aboard Skylab while in orbit in January that has just been presented him by Dr. James C. Fletcher, NASA Administrator.

JPL, CALTECH FEATURED

The Jet Propulsion Laboratory and the California Institute of Technology are featured on two of a series of six medallions commemorating 1974 as Centennial Year in Pasadena, CA.

JPL is saluted as symbolic of the city's technological leadership in a medallion featuring the flight of Mariner 10 to the innermost planets of Venus and Mercury. Though launched in 1973, the bulk of the spacecraft's work has been accomplished during the centennial year.

The city's leadership in education is symbolized by the Caltech medallion.

Others in the series include: government, symbolized by the Pasadena City Hall; culture, in Huntington Library and its adjacent gardens and art galleries; entertainment, in the Tournament of Roses Parade held annually on New Year's Day; and sports, in the annual Rose Bowl football classic.

The series is available in sets of six two-inch proof silver medallions with a certified limited edition of 3,500 complete sets. Each weighs 1,000 grains, has a purity of 999+ fine, a mirror-proof finish, and is produced by the Jacques Cartier Mint.

Additionally, the Mariner 10 and City Hall medallions are available in two-inch satin bronze coins.

Complete information about the series may be had by writing Pasadena Centennial Medallions, Inc., 260 South Los Robles Avenue, Pasadena, CA 91101.

BOOK TELLS ABOUT ERTS

A new book on the ERTS program, "The Earth in the Looking Glass," by Lloyd Darden, has just been published by Anchor Press/Doubleday of Garden City, NY. A 324-page volume, it tells "how the exciting new technology of remote sensing uncovers hidden sources of energy, food, raw materials — even polution," and is priced at $7.95.

HANDICAPPED HONORED

National Employ the Handicapped Week was observed at the Marshall Space Flight Center in early October as a reminder that many jobs can be done as well by handicapped persons as by others, and some even better.

The Center currently employs 193 handicapped persons. Eleven of these are women and 149 are veterans. During the last 12 months, MSFC has hired two handicapped persons and presented awards to 29.

'OUR INTERFACE WITH THE NOAA EML PEOPLE HAS BROKEN DOWN AND THERE'S A POSSIBILITY OF AN ANOMALY OCCURRING IN WHAT OUR PROJECTED PARAMETERS INDICATED WOULD BE NOMINAL OPERATION WHEN THE ATS GOT INTO SYNCHRONOUS ORBIT.'

SPEAKING OF SPACE, ALICE * * * *

"Excuse me, Mr. Jones. I've been working at NASA for eight months now and I'm trying to learn as much as I can about the agency, but I find the language around here is foreign to anything I was ever taught."

"Don't worry about it, Alice. It's just that—like every other business or trade—NASA has its own jargon of slang terms and acronyms. We are dealing with a wide variety of projects and a lot of them are in fields nobody has ever explored before, and a lot of existing words have meanings that might sound strange at first.

"I admit even I sometimes attend meetings and come away glassy-eyed after hearing such statements as 'our interface with the NOAA EML people has broken down and there's a possibility of an anomaly occurring in what our projected parameters indicated would be a nominal operation when the ATS got into synchronous orbit.' "

"Huh?"

"In that instance, the program manager was saying that his friends at NOAA (National Oceanic and Atmospheric Administration) has neglected to tell him that the planned synchronous (stationary with the Earth's rotation) orbit of an Applications Technology Satellite possibly was not going to be just exactly right for sending weather photographs to NOAA's Experimental Meteorological Laboratory in Miami. As it turned out, everything was nominal."

"Nominal?"

"Yes, Alice, nominal. That's one of the oldest and favorite NASA-isms. Not being an engineer, you probably think of the word as meaning a lot of things like a small amount, in name only, relating to nouns, etc., but at NASA it simply means 'normal.' "

"Why?"

"Well, it seems that, early on, some of our scientists and engineers found a dictionary or textbook that interpreted the word to mean 'performing as expected.' "

"That's kind of interesting. If there any *one* place I can go to find out what all the words and the acronyms mean? I want to get ahead, and being ignorant isn't going to help"

"Alice, I'll put it to you straight—I doubt if even in Heaven they know what all our acronyms mean. The Public Affairs newsroom can usually figure them out, though. They have resources we don't have in this office. You were here during Skylab, weren't you?"

"Yes, sir, but I couldn't figure out much of what was going on, just listening to the people on the elevators talk about it. They were using terms like 'the Radial Docking Port in the side of the MDA cylinder' and wondering if the 'Habitability Support System was functioning okay.' "

"Wish you'd mentioned it to me at the time and I could have cleared it up for you. On Skylab, one of the contractors published a 136-page book called Skylab Astronyms—it was loaded with goodies. You could talk for an hour out of that one without repeating yourself or anyone understanding a word you had to say. Hey, I have a good idea."

"What's that, Mr. Jones?"

"You know our next big programs are ASTP and the Viking."

"I have a folder on the Apollo-Soyuz Test Project, and isn't Viking the one where we land on Mars?"

"Right, only we soft-land two spacecraft and there are no men involved. Why don't you become an expert on Viking? Another of our contractors—they publish these booklets to be sure that we and they are on the same wave length—has just published a Dictionary of Viking Acronyms. It only runs 22 pages with about 60 acronyms per page."

"Yes, I guess I could memorize a relatively small amount like that, but what do I do about the old

ones? Like I heard a man yell down the hall to a friend today and ask if ITOS is on schedule."

"Hmmmmmmmmm. Alice, you ran into a real complex one that time, but not if you really think about it. The ITOS is the Improved TIROS Operational Satellite we launch for NOAA. You already know about NOAA, but this satellite has an acronym within an acronyym. Come to think of it, it's kind of beautiful when you figure how tricky we can get. You see, the T in ITOS stands for TIROS or Television Infrared Observation Satellite, a perfectly good acronym all by itself."

"That really *is* clever. I think I'm beginning to catch on. I heard one of our officials make a speech last week in which he used the term 'at this point in time.' Does that have any particular significances or special meaning?"

"Not really; he simply meant 'now,' but 'at this point in time' is pretty 'in' around town now, and he probably just tossed it in to show he is in tune with the times. Being the pioneering agency we are, people expect only the latest and best from us and we try to—and usually do—give it to them."

"You remember, Mr. Jones, a couple of weeks ago you let me go to a press conference in the auditorium on the ATS-6. From what I heard, it sounded more like they were talking about the ATS-F I had seen a news release on."

"As a matter of fact, Alice, they were; you see, unmanned satellites are designated with a letter before launch, but, once in orbit, they are assigned a number. That'd how ATS-F got to be ATS-6."

"Why is that?"

"I don't exactly know. We've always done it that way."

"Before I joined NASA, Mr. Jones, I followed the space program on radio and TV and in the news magazines and newspapers. I noticed that there was some confusion about Roman and Arabic numerals. For example, some papers would use Apollo 9 while it might be Apollo IX in another, but they were never Apollo F and G. Which is right?"

"That's relatively simple. A decision was made by NASA in the mid-sixties to designate launch vehicles only—like Saturn V and Titan II—with Roman numerals and everything else with Arabic. The communications media didn't all get this message or, if they did, they chose to use their own designations. Manned missions did not use the letter/number-in-orbit policy."

"But, Mr. Jones, I have found inconsistencies right here in the agency. Some of our publications use Apollo XV and others Apollo 15. Why?"

"You might put that under the heading of literary license—some of our writers prefer Roman style and use it."

"Our astronauts seem to like the Roman numerals, too."

"How's that, Alice?"

"The other day I was looking at a sheet picturing the 11 Apollo patches and six of them used Roman numerals. How about that?"

"You have a sharp eye. I hadn't noticed that. The astronauts are allowed to design their own mission patches, and I guess they use whichever style numeral they think complements the overall design best."

"Boy, have I got a lot to learn!"

"As I said, Alice, don't worry about it. Eventually you'll catch on to most of it by listening, by reading, and by osmosis. Meantime, quiz yourself on these five common NASA terms: breadboard, ruggedize, stable 1, slip, and egress-ingress."

BOYD MYERS HONORED

Boyd C. Myers, II, Assistant Associate Administrator for Organization and Management, was among Federal employees honored with plaques and citations at the recent 10th Annual Federal Paperwork Management Awards Lunch held in Washington.

Boyd C. Myers, II

He was cited for his work in developing the Philosophy and procedures for the NASA Reports Management Review Board, of which he has served as chairman. As a result of his efforts, it was pointed out in his citation, 147 out of 500 reports reviewed under his chairmanship were eliminated, resulting in annual cost savings of $1.2 million to date, with the possibility that there will be further savings when the technique developed is applied to the space agency's field installations.

The awards program is sponsored annually by the Association of Records Executives and Administrators (AREA), in cooperation with the National Archives and Records Service of the Government Services Administration and with the endorsement of the Civil Service Commission. The result awards are among those most prized by Federal employees.

A graduate of the Virginia Polytechnic Institute, Myers has been associated with NASA and its predecessor, the National Advisory Committee for Aeronautics, since 1947 when he joined the Langley Research Center as an aeronautical research scientist.

91 AWARDS ARE PRESENTED AT ANNUAL NASA CEREMONY

Fletcher Says Honors Bestowed Tell Story of Year's Activities

In one of the most extensive Annual Award Ceremonies in recent years, 91 individuals and groups were recognized for their contributions to the space program at NASA Headquarters on Oct. 29.

Medals were presented by Dr. James C. Fletcher, NASA Administrator, and certificates by Dr. George M. Low, Deputy Administrator. Names of awardees and their citations were read by James Kukowski of the Public Information Division.

In opening the ceremony, Dr. Fletcher said the honors to be awarded "tell the story of the intense efforts and steady progress" made throughout NASA in the last year.

"This year," he added, "we are recognizing the fact that persons at lower levels in all kinds of positions at NASA can, and should, be given special recognition for exceptional performance and other achievements in their particular field."

In reviewing NASA's activities during the last year, he said: "The revolution in global and domestic communications made possible by space technology has now begun. The beneficial impact on education, health, sea and air navigation, and indeed every aspect of human life, will be beyond calculation. Current opportunities for the private sector to further develop and use this new technology are almost without limit."

Awards were presented by category as follows:

Group Achievement—ALADDIN '74 Project Team; Explorer-C Project Team; ATS-6 Project Team; B-1 Safety Survey Team; Ames COAD Team; Deep Space Network S/X Feed System Development Group ; EEO Recruitment Team; F-15 RPRV Project Team; Headquarters Maintenance and Operations Division; M212 Biocore Experiment Team; Operation Kohoutek Team; SMS-1 Project Team.

Public Service Award—Ad Hoc Panel on Cardiovascular-Metabolic Effects of Space Flight, Committee on Space Biology and Medicine, Space Science Board, National Academy of Sciences.

Equal Employment Opportunity Award—Julian M. Earls, Cleveland Chapter of the National Technical Association; Jeannette M. Scissum; Gregory V. Selby; and Valerie L. Thomas.

Exceptional Scientific Achievement Medal—Roger A. Anserwon, LaRC; G. Melvin Ault, LeRC; Anne T. Barber, LeRC; Frank R. Batty, MSFC; Gilbert A. Branchflower, GSFC; George W. Brooks, LaRC; Claude W. Coffee, Jr., LaRC; James F. Conners, LeRC; William O. Davis (presented posthumously), NOAA; S. Chris Dunker, GSFC; Joseph R. Duke, Wallops Flight Center; Einar K. Enevoldson, FRC; Henry W. Flagg, Jr., JSC; Don V. Fordyce, GSFC; Michael J. Garbacz, Headquarters; Alfred Gessow, Headquarters; Edmond J. Golden, Headquarters; David W. Grimes, GSFC; Jeffrey T. Hamilton, Headquarters; Peter J. Haro, ARC; Daniel H. Herman, Headquarters; Henry C. Hoffman, GSFC; Rhoda S. Bernstein, GSFC; Marshall F. Humphrey, JPL; Charles B. King, LaRC.

Richard E. Kuhn, LaRC; Myron W. Krueger, Headquarters; James Lazar, Headquarters; William G. Lewers, Wallops Flight Center; Jack R. Lister, JSC; Robert L. Lohman, Headquarters; Walter La Fleur, GSFC; Richard B. Marsten, Headquarters; Marvin R. McClain, JPL; Dudley F. McConnell, Headquarters; Robert A. McDaris, KSC; William G. Melbourne, JPL; Dema S. Nappier, Headquarters; William D. Merrick, JPL; Theodrick B. Norris, Headquarters; Albert Rango, GSFC; Robert L. Reeves, MSFC; Melvin Sadoff, ARC; Nina Scrivener, Headquarters; Daniel J. Shramo, LeRC; Joseph W. Siry, Headquarters; Gerald M. Smith, JPL; Kenneth R. Webster, Headquarters; Albert A. Whalen, GSFC; and Harold Zweigbaum, KSC.

Exceptional Scientific Achievement Medal—Siegfried J. Bauer, GSFC; Reinhard Beer, JPL; Albert E. Belon, Geophysical Institute, University of Alaska; Ralph Bernstein, IBM Corporation; William A. Brooks, LaRC; Crofton B. Farmer, JPL; Honsuk H. Kim, Wallops Flight Center; Henry G. Kosmahl, LeRC; Norman H. MacLeod, American University; John M. Miller, Geophysical Institute, University of Alaska; Edward C. Polhamus, LaRC; S. Ichtiaque Rasool, Headquarters; Gary C. Russell, JPL; David E. Smith, GSFC; John E. Raber, TRW Systems Group and Thomas E. Wilheity, Jr., GSFC.

Distinguished Public Service Medal—Jack M. Campbell, President, Federation of Rocky Mountain States; Harry Dornbrand, Executive Vice President, Fairchild Space and Electronics Company; and Jesse L. Greenstein, California Institute of Technology.

Distinguished Service Medal—Robert L. Krieger, Wallops Flight Center; Norman Pozinsky, Headquarters; Martin L. Raines, JSC; Lee R. Scherer, FRC; and John M. Thole, Headquarters.

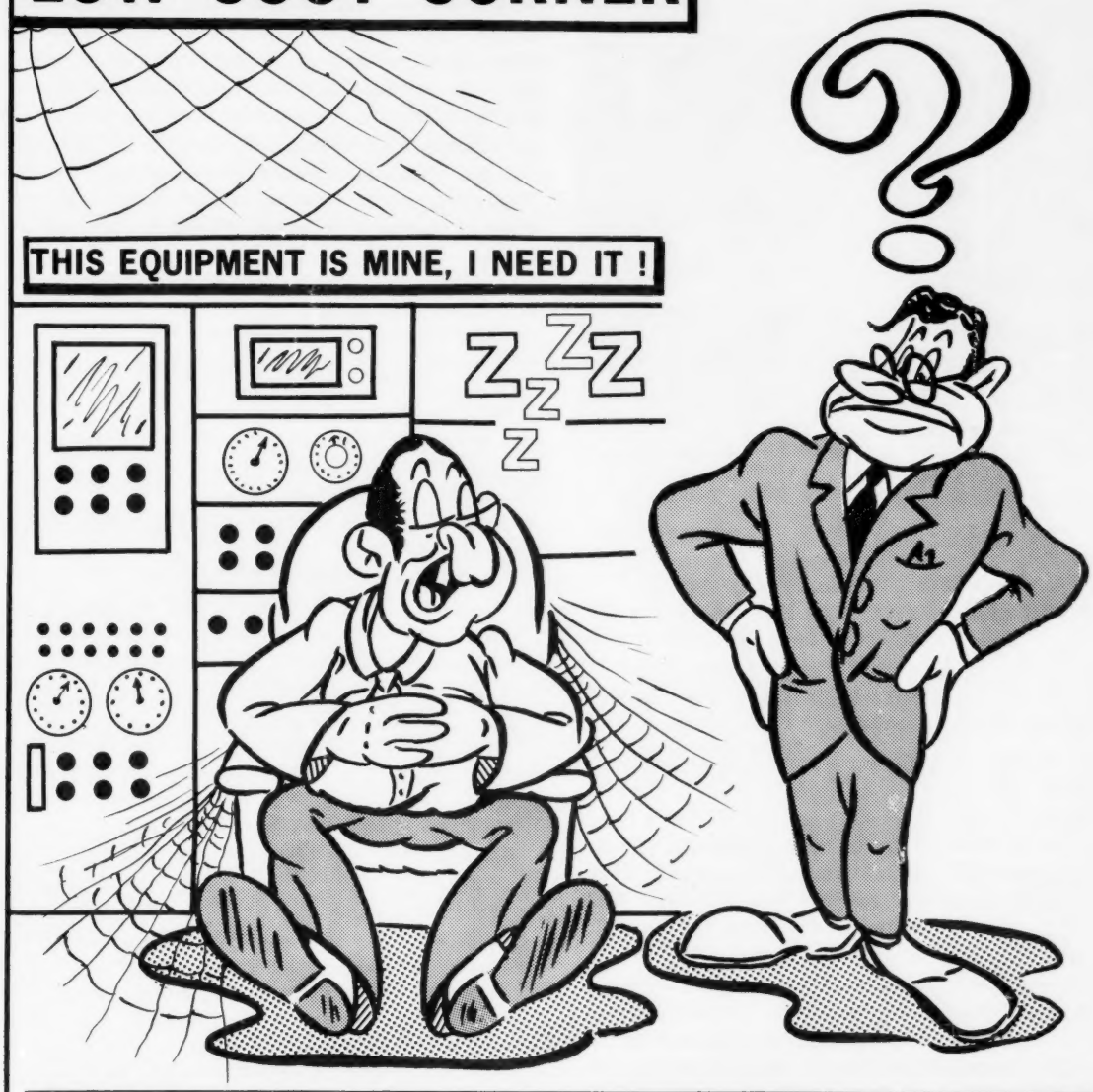
WHITCOMB HONORED AGAIN

Dr. Richard T. Whitcomb, Head of the Eight-Foot Tunnels Branch of the High-Speed Aircraft Division at Langley Research Center, who last May received NASA's largest cash award for his development of the supercritical wing, an improved airfoil design, has been chosen by the Aero Club of Washington, DC, to receive its 1974 Wright Brothers Memorial Trophy.

The trophy will be presented to Dr. Whitcomb for his "significant public service of enduring value to aviation in the United States" at the annual Wright Memorial Dinner, to be held at the Washington Hilton Hotel on Dec. 17, the anniversary of the Wright brothers' first powered flight at Kitty Hawk, NC.

A reception, to which many prominent people have been invited, will precede the dinner. Dancing will follow.

LOW COST CORNER



TAKE ANOTHER LOOK AT THE "ACTIVE" EQUIPMENT YOU'RE HOLDING. SOMEONE ELSE MAY REALLY NEED IT!

SEE YOUR EQUIPMENT VISIBILITY SYSTEM COORDINATOR

FOR FURTHER INFORMATION CALL-OFFICE OF SUPPLY & EQUIPMENT MANAGEMENT
202-755-8313

AWARD WINNERS—Dr. Carolyn Huntoon and Dr. John E. Naugle (right), at the National Civil Service League's Career Service Award ceremony with Dr. George M. Low, Deputy NASA Administrator.

TWO NASA OFFICIALS GIVEN CAREER SERVICE AWARDS

Dr. Naugle and Dr. Huntoon Recognized for Outstanding Public Service

Two NASA officials were among 11 government workers presented the National Civil Service League's Career Service Award for 1974 at a ceremony at the State Department's Diplomatic Reception Area in Washington Oct. 9. They are Dr. John E. Naugle, Deputy Associate Administrator, and Dr. Carolyn Huntoon, head of the Endocrine Laboratory at Johnson Space Center.

Only once before in the 20 years the award has been made has an agency—the Department of Health, Education and Welfare—had two of its employees receive it during the same year.

The Career Service Award is presented annually by the League, a citizen group that works for better government at every level, to top federal officials in order to spotlight the high quality of public servants, to encourage quality job performance, and to spur able youth to build government careers.

Dr. Naugle was one of seven to receive the award for Sustained Excellence, which recognizes officials with at least 10 years of outstanding public service. Under his leadership, it was pointed out, science researchers have mapped Mars' entire surface, collected the first detailed scientific information about Jupiter and its moon, and advanced the use of unmanned spacecraft as astronomical observatories.

Dr. Huntoon was one of two to be presented the award for Special Achievement, recognizing accomplishments without regard to length of service. She was introduced at the ceremony by Lillian R. Levy, Senior Science Writer and Assistant Director of NASA's Division of Public Services, who said of her: "Though earthbound, she is an active and creative participant in space exploration and devised a highly important experiment for Skylab. Its purpose: to assess the effect of space flight on the human metabolism. Such knowledge is vital in determining how far and how long human travelers may venture in space."

MRS. HARRIS HONORED

Several outstanding honors, including plaques and annual memberships established in her name, have been accorded Mrs. Ruth Bates Harris during the period since she took office as NASA's Deputy Assistant Administrator for Community and Human Relations.

After becoming one of four among 125 nominees to receive the 1974 Sojourner Truth bronze statuette from the Black Women's Community Development Foundation "for her contributions to the American society through government," she received the following recognition:

Two annual memberships established in her name by the Howard County Chapter (MD) of the National Council of Negro Women "to motivate young women to aspire for leadership roles."

An engraved plaque from the Maryland State Conference of the NAACP "for her indomitable fight for justice."

A citation from the Alpha Phi Alpha Fraternity, Silver Spring, MD, "for her contributions to her fellow human beings through her personal example of courage, perseverance, integrity, and commitment to equal opportunity, as well as through her successful career in human relations and her close association with the NAACP in its continuing fight for full freedom."

A bronze plaque from the National Business League "for dedicated service in numerous federal, state and city positions—for outstanding contributions in the fields of Civil Rights, Social Service, Human Rights and Public Welfare."

MARSHALL AIDS MINORITIES

In a concerted effort to further assist minority business enterprise in obtaining federal contracts,

the recently established Minority Business Enterprise Program Council at the Marshall Space Flight Center has developed and is executing a comprehensive activities plan for fiscal year 1975 and beyond.

The Council, consisting of 18 of the Center's top management personnel, aims to create interest and much more involvement by top management and all other Center personnel in administering and ensuring a fully effective Minority Business Enterprise Program at MSFC.

The Council's plan includes efforts to expand prime contracting with minority business firms; encouraging prime contractor subcontracting to minority firms; and additional emphasis on minority contracting under the Section 8(a) Program of the Small Business Act, by which federal agencies can award non-competitive contracts to minority-owned businesses.

VON BRAUN RETURNS—Dr. Wernher von Braun (left), the founding Director of the Marshall Space Flight Center, returned for a visit last month. He is shown with Dr. William R. Lucas, present Director, and a model of the Spacelab being developed for launch aboard the Space Shuttle.

SOLAR HEATING-COOLING EFFORT

NASA has begun action to carry out the assignments under the Solar Heating and Cooling Demonstration Act (PL-93-409) recently passed by the Congress and signed into law by President Ford.

The law requires NASA, the Department of Housing and Urban Development (HUD) and certain other federal agencies to cooperate in the development and demonstration of residential and commercial heating and cooling systems using solar energy.

The legislation authorized $5 million each for NASA and HUD for the first year. A joint program plan is to be provided to the President and Congress within 120 days after enactment of the bill.

Dr. George M. Low, Deputy NASA Administrator, has designated Marshall Space Flight Center as lead center in discharging the agency's responsibilities, under the direction of the NASA Office of Energy Programs.

NASA's development work will build upon earlier work done in this area by various NASA centers and industrial and educational institutions. Included in this pioneering work is a residential solar energy heating and cooling demonstration at MSFC, where a simulated house of average family size is being cooled and heated mainly through the use of sunshine.

Demonstrations of solar heating (only) of buildings are to be accomplished within three years and of both solar heating and cooling within five years.

NASA is responsible for development and procurement of solar heating and cooling equipment which HUD will install and demonstrate in residential type buildings. Projects to demonstrate solar heating and cooling in commercial type buildings will be arranged by NASA in conjunction with other government agencies.

FLETCHER VISITS JAPAN

Dr. James C. Fletcher, NASA Administrator, visited Japan during October to discuss current and future programs for the exploration and use of space and to evaluate opportunities for cooperation in projects of mutual interest to that country and the United States.

He was invited there by Science Minister Minji Moriyama, Director-General of Japan's cabinet-level Science and Technology Agency and the Chairman of the policy-making Space Activities Commission.

While there, Dr. Fletcher met with representatives of government agencies, the scientific community, and Japan's Federation of Economic Organizations. He also visited the Tanegashima Space Center and the Uchinoura Space Center at Kagoshima.

Japan has participated in several U.S. space programs during the last decade. Japanese scientists were selected as principal investigators in

NASA's lunar sample analysis program and are contributing to research studies for NASA's first experimental Earth Resources Technology Satellite (ERTS-1) and for the Earth Resources Experiment Package carried aboard Skylab.

Japan's future space projects include a geosynchronous meteorological satellite, part of an international weather satellite network to be established in this decade with the U.S., the Soviet Union, and the European Space Research Organization. The first element of the system, NASA's Synchronous Meteorological Satellite (SMS-1), was launched last May 17. Japan's satellite is scheduled to be launched by NASA in late 1976.

HURRICANE RELIEF—Charles Bush, President of KSC's Amateur Radio Society, sits at the microphone used there recently in relaying messages between Honduras and the U.S. after Hurricane Fifi devastated that country.

RELAYING HURRICANE MESSAGES

The Amateur Radio Society at Kennedy Space Center provided a round-the-clock communications link between Honduras and points in the United States during the recent devastation caused in that country by Hurricane Fifi.

The Society, sponsored by KARS, the Center's recreation and social club, is made up of KSC employees. During the period immediately after the storm, its members logged thousands of transmissions, its 1,000-watt "ham" transmitter functioning as Net Control for the International Missionary Radio Association Honduras Relief Network.

Requests for food and medical supplies, inquiries about relatives or friends, and weather reports for relief aircraft ranked high on the list of messages handled. They were relayed to the Honduran Embassy in Washington, relief agencies, and individuals in the U.S.

SOVIET CONTROLLERS TRAIN

Soviet flight controllers preparing for next summer's Apollo-Soyuz Test Project (ASTP) mission began two weeks of training at the Johnson Space Center on Oct. 24.

NASA flight controllers received two weeks' training in the Soviet Union during September.

About 20 Soviet controllers, representing the various flight control disciplines for the ASTP mission, attended sessions on Apollo trajectory, spacecraft systems and communications, the docking module, Mission Control Center operations and contingency flight planning.

The Soviet personnel included flight directors; specialists for capsule communication, flight dynamics and trajectories, spacecraft systems, docking, life support, engineering and development, and inter-control center communications; and interpreters.

During the conduct of the actual mission, only about eight of the Soviet controllers will be in the Houston Mission Control Center. A similar group of NASA flight controllers will be in the Soviet mission control facility.

The two spacecraft for the joint mission are scheduled for launch July 15, 1975, with docking operations planned for the third day of the mission. The crews will transfer back and forth between the two spacecraft and will perform joint experiments during the two days the Apollo and Soyuz are linked in Earth orbit.

BUS DRIVER TO SPECIALIST

Manuel Virata

Manuel "Manny" Virata, who changed from school bus driver in Maryland to Employee Development Specialist at Kennedy Space Center, reports that he is pleased he made the switch. A January graduate of Bowie State College, Maryland and now pursuing a Master's degree at Stetson University, Deland, FL, he describes his job in the Personnel Office at KSC as "interesting and challenging."

ZEILER TO RETIRE

Albert Zeiler, Chief of Design Engineering's Mechanical Design Division at Kennedy Space Center, will retire Dec. 6, ending a rocketry career covering three and a half decades.

His involvement with rocketry has extended from the beginning of the V-2 at Peenemuende to the threshold of the Space Shuttle era at KSC.

Born and educated in Austria, he entered the field of rocketry as a material test engineer at the German Rocketry Research Center at Peenemuende in 1939, after five years as a production engineer in private industry. He came to the U.S. with Dr. Wernher von Braun in 1946, under contract to the U.S. Army as technical advisor to the Ordnance Guided Missile Research and Development Operations at White Sands Proving Grounds in New Mexico. In 1950, he moved to Huntsville, AL, where he continued ramjet development at the Redstone Arsenal Guided Missile Center, and in 1960 joined NASA as Assistant Director for Facility Development and Ground Support.

Zeiler served as a member or consultant with various technical committees or working groups for the Saturn, Mercury, Nike-Zeus, Jupiter, Jupiter C, Juno II, Redstone and Pershing projects. In 1961, he became Assistant Director of Facilities, Launch Operations Directorate, Marshall Space Flight Center, and in 1963 was assigned Center Coordinator for Mechanics and Propulsion, Launch Vehicle Operations, at KSC. He took over his present position in May, 1967.

RESEARCH REVIEW SPONSORED

The Second Annual Research and Technology Review was conducted at the Marshall Space Flight Center Oct. 8-9. Sponsored by the Science and Engineering Directorate, the 41 papers presented by Center personnel covered a spectrum of activities ranging from astronomy to ultrasonic measuring techniques.

Much of the research and technology reported was related to the Center's role in development of the Space Shuttle, but a significant effort was devoted to other key assignments such as electronics, space processing and use of space technology in Earth application.

The two-day program was presented to an audience of scientists and engineers from NASA, regional universities, the aerospace industry and other government agencies.

RAINFALL MEASUREMENT VIA SATELLITE—Cecilia Griffith of the NOAA's Experimental Meteorology Laboratory in Miami indicates how she measures rainfall accurately by comparing satellite imagery with radar scans of the identical area at the same time.

MEASURING EARTH'S RAINFALL

A young weather researcher using an aging NASA satellite is fast approaching a breakthrough in accurate measurements of Earth's rainfall from space.

The researcher is 25-year-old Cecilia Griffith of the National Oceanic and Atmospheric Administration's Experimental Meteorology Laboratory (EML) in Miami, and the satellite is Goddard Space Flight Center's Applications Technology Satellite-3 (ATS-3) launched into synchronous orbit (22,300 miles in altitude) in 1967.

Rain gauges, which catch rain and are regularly monitored by human effort, presently are the most accurate and commonly used means by which to measure the extent of a rainfall. The large number of people required to tend and service the gauges, however, limits the usefulness of the device in remote, unpopulated regions. A method of rainfall measurement other than the maintenance and reading of rain gauges is needed in inaccessible parts of developing countries to provide the flood warnings often vital to the low-lying, populated regions in the path of floodwaters.

Ms. Griffith's rainfall research, for the last 18 months under the direction of Dr. William Lee Woodley, acting director of EML, has been concentrated on comparisons of ATS-3 imagery with radar scans of the identical area at the same time, to obtain measurements of cloud size and brightness. Clouds visible in the satellite pictures are color coded according to degree of brightness, and cor-

responding radar echos are matched. The study has shown that when a cloud reaches a specific level of brightness the chance of precipitation within that cloud is 50 per cent. As brightness increases, so does the precipitation probability.

Earlier studies by Dr. Woodley showed a distinct relation between the amount of rainfall associated with an echo and the area of that echo as measured by radar. Experimenters subsequently sought to link the relation of rain volume in the radar echo area to cloud brightness and cloud area as measured by the ATS-3.

The cloud echo relationship is still under study, but a preliminary test of the rainfall measurement method recently made in SML's experimental (4,800-square-mile) seeding area located in central Florida showed favorable early results. The area is well instrumented with rain gauges.

Volume of rainfall was computed by two methods, the first using satellite images, the second by a combination of radar and the rain gauge readings. The satellite computations proved to be within a factor of two of the radar-gauge volumes.

After the derivation is computed, the method will be tested in other areas of the tropics and subtropics. If successful, accurate rainfall measurements in remote mountainous areas, for example, would give urban and farm populations ample time to prepare for high or flooding rivers fed by mountain streams.

Developing countries, now unable to afford extensive rain gauge networks, could improve their predictions of national agricultural output on the basis of the amount of rainfall. They also could plan hydrology projects and achieve a better understanding of the economic impact of the country's water resources.

IAF CONGRESS ATTENDED

Three men from Marshall Space Flight Center attended the 25th Congress of the International Astronautical Federation (IAF) in Amsterdam, The Netherlands, recently.

They were Dr. Ernst Stuhlinger, Associate Director for Sciences, who chaired a session at the Congress; George D. Hopson, Chief of the Engineering Analysis Division, Structures and Propulsion Laboratory, who delivered a paper entitled "Flight Operations and Performance of Skylab Life Support and Environmental Control Systems"; and William E. Davidson, Spacelab Resident Manager at the European Space Research and Technology Center, Noordwilk, The Netherlands.

GROO VISITS FRC—Associate Administrator for Center Operations Elmer S. "Todd" Groo (second from left) recently visited the Flight Research Center and was given a tour and briefing on current activities. Shown with him in front of one of the Center's F-104 aircraft are Research Pilot Bill Dana (left), Center Director Lee Scherer (second from right) and Deputy Dave Scott.

CERNAN VISITS EUROPE

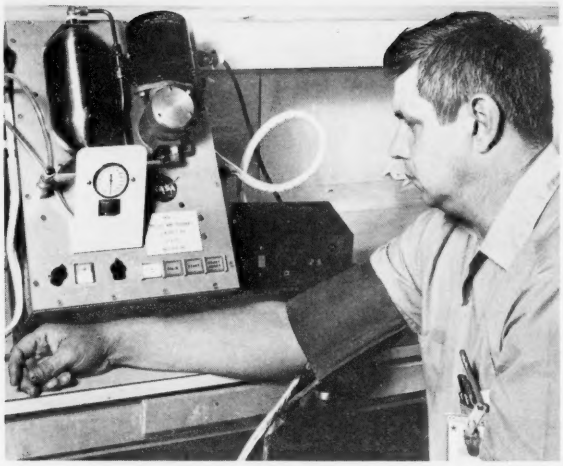
Astronaut Gene Cernan, Special Assistant to ASTP Manager Glenn S. Lunney, recently returned from a two-week visit to Russia, Yugoslavia, Romania and Czechoslovakia.

His stay in Russia was in connection with the ASTP project. When his duties there were completed, he visited the last named three countries at the request of the United States Information Agency to take part in a series of specially-arranged events, including a "Progress and the Environment" exhibit in Bratislava. He also made a trip to a small village in the mountains of Czechoslovakia from which his grandfather migrated to the U.S. in 1903.

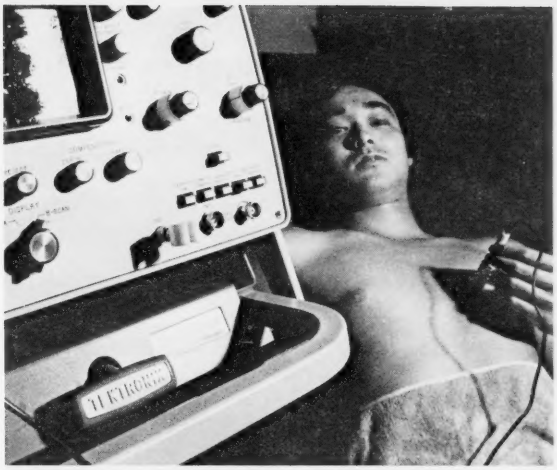
While abroad, Cernan met U.S. Ambassador to Austria John Humes; Congressman John Blatnik of Minnesota, traveling in Eastern Europe; and Leonard Garment, then Assistant to the President.

Human intervention has resulted in the recent release of more than 4,000 newly-hatched loggerhead and green turtles into the Atlantic Ocean along wild beaches at Kennedy Space Center, traditional breeding grounds for giant sea turtles in summer months.

Sponsoring the effort to spare thousands of turtle eggs from almost certain extermination are wildlife experts from the Interior Department's Merritt Island National Wildlife Refuge, which manages non-operational areas of the spaceport.



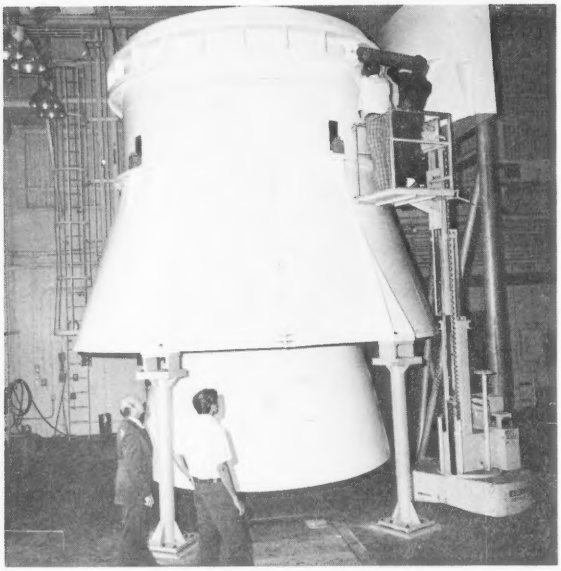
CHECKING BLOOD PRESSURE—Bob Weggemann, an engineering technician in Johnson Space Center's Bioengineering Systems Division, demonstrates a blood pressure monitoring system originally developed for the NASA Integrated Medical and Behavioral Laboratory Measurement System Program (IMBLMS) and now being used in studies on the control of high blood pressure in human beings.



DIAGNOSING THE HEART—A small, battery operated device called an ultrasonoscope is being developed by NASA and Stanford University to permit rapid and safe diagnosis of heart abnormalities. High frequency sound waves not audible to the human ear are transmitted through a hand-held probe, as shown here, applied to a patient's chest.

CHECKING BRIDGE STRESS—In the above photograph, a technician mounts space-developed vibration sensors called Randomdec on a bridge in California to measure the effect of traffic and weather on its structural integrity. Data obtained are used as part of an overall program conducted jointly by Ames Research Center and the Federal Highway Administration to find a way to detect bridge defects, something for which there is no reliable, inexpensive method at present.

WATER-COOLED HELMET—Engineers at Ames Research Center have developed a unique liquid-cooled helmet liner designed to reduce body temperatures of helicopter pilots, fire-fighting-vehicle operators, race drivers, and others who must work in high temperature, high-humidity environments. It consists of polyurethane patches which have tiny channels of cool water circulating through them. A standard hard helmet can be worn over the liner for safety purposes.



MOCKUPS CONSTRUCTED—Full-scale mockups of the aft sections of a Solid Rocket Booster such as this for the Space Shuttle have been completed at Marshall Space Flight Center. They will serve as engineering and tooling aids for verifying interfaces and dimensions and in determining other requirements.

KSC MINORITY COUNCIL

The Kennedy Space Center has established a Minority Business Enterprise Council designed to expand the participation of minority enterprises in NASA activities.

Establishment of the Council, part of a NASA-wide program to further assist minority business enterprises in obtaining federal contracts, will provide a central planning and reviewing authority to assist the Center in its activities of this nature.

Miles Ross, Acting Director, will serve as Chairman. Members include Dr. R. H. Gray, W. H. Rock, G. A. Van Staden, R. L. Clark, F. H. Miller, Dr. W. J. Kapryan, P. A. Minderman, E. F. Parry, G. L. Harris, W. M. Lohse, E. C. Spivey, Nate Pilate and B. J. Dryer, III, Executive Secretary.

SOLAR POWER STUDY

Business and industry have been asked for proposals for a study of space-based solar power conversion and delivery systems in a Request for Quotations issued by Marshall Space Flight Center.

Previous studies have defined concepts for generating power in geosynchronous Earth orbit and transmitting it to Earth via microwaves. Other studies have defined concepts for generating power in remote locations and transmitting it to the desired location via an orbital microwave relay system.

MSFC BRACES FOR TORNADOES

Marshall Space Flight Center, which was damaged by spring tornadoes last April, has set up a warning system to take care of such emergencies in the future.

When a storm is indicated or forecast, the report is passed to Sidney J. Sweat, MSFC Civil Defense Director, and other designated employees who will staff an Emergency Operations Center equipped with telephones and radio in the basement of a headquarters complex building. There all weather changes will be displayed on closed circuit television.

If a tornado watch progresses to a tornado warning, coordinators and fire and safety monitors on each floor will advise personnel as to what steps to take to protect themselves.

Meanwhile, a contract has been let to a local concern to repair damages caused last spring.

CEREBRAL PALSY RESEARCH—Small electronic body sensors developed by NASA for space research are being used at the Stanford University Children's Hospital at Palo Alto, CA, as shown here, to measure the precise walking patterns of children with cerebral palsy. Understanding walking patterns or gaits of victims is important in prescribing physical therapy for individual leg muscles.

MSFC SECRETARIES HONORED—Mrs. Betty Qualls (left), Alabama Division President, National Secretaries Association (International), presents certificates designating two Marshall Space Flight Center employees as Certified Professional Secretaries. They are Mrs. Lorena Neisler (center), who works in the Office of the Deputy Director, and Mrs. Linda Phillips, employed in the Test and Requirements Branch, Shuttle Project Office.

NEW NASA PUBLICATIONS

SPACE BENEFITS/MEDICINE, a pocket-sized folder produced by the Office of Public Affairs, describes systems and devices born of NASA-developed technology that are finding medical applications in many practical and beneficial ways. Available through the Public Information Office at Headquarters and all of the Centers.

MR-15, THE FINAL SKYLAB MISSION, an eight-page summary, has been produced by and is available through the Public Affairs Office at Headquarters.

THE VIKING MISSION TO MARS, a 77-page monography describing NASA's program to explore that planet, is written in a manner intended to be understandable to everyone. It covers the purpose of planetary exploration, Viking's target, its mission, the spacecraft and launch vehicle, Viking scientific explorations, the touchdown on Mars, and the Viking team. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, at $1.20 per copy. (NASA Sp-334)

FILM ACTIVITY

The NASA film "MARS—THE SEARCH BEGINS" was awarded a diploma of honor and bronze plaque from the recent Congress of the International Science Film Association in Hungary. This is the sixth award for this film from competition in national and international film festivals.

RADIO-TELEVISION
(Released Nationally)

NOVEMBER

TELEVISION — A color film release in the *Aeronautics and Space Report* series, "Space Technology Improves Heart Pacemaker."

RADIO — Four weekly *Space Stories* have been released: "Apollo-Soyuz Status," (Hqs/Lee); "Viking Mars Life Search," (ARC/Klein); "Solar Energy Research," (Hqs-Schmitt); and "Pioneer-11 Encounters Jupiter," (ARC/Hall). One monthly *NASA Special Report*, "Pioneer-11 Encounters Jupiter." One set of quarterly announcements, *NASA Space Notes*, (ten 60-second informational spots).

LUNAR SAMPLE EXHIBITS

The following is a schedule of lunar sample exhibits from Nov. 15 to Dec. 15:

ALABAMA—Gem and Mineral Society, Huntsville, Nov. 22-24.

FLORIDA—Florida Shopping Centers, pending further action.

INDIANA—Indianapolis Baptist Temple, Greenwood, Nov. 13-17

MISSOURI—Third Space Week, McDonnell Planetarium, St. Louis, Nov. 10-16.

NORTH CAROLINA—Coastal Carolina Gem, Mineral and Archaeological Society, Hobgood, Nov. 23-24.

SOUTH CAROLINA—Chitlin' Strut, Salleg, Nov. 30.

TEXAS—Houston Museum of Natural Science/History, End of Caroline at Hermann Park, Houston, Nov. 15-Dec. 15.

Permanent Displays

ALABAMA—Visitor Information Center, Marshall Space Flight Center (located at the Alabama Space and Rocket Center, Huntsville.)

FLORIDA—Visitor Information Center, Kennedy Space Center.

KANSAS—Eisenhower Library, 200 SE 4th Street, Abilene.

NEW YORK—United Naions Building, New York.

OHIO—U.S.A.F. Museum, Wright Patterson AFB.

TEXAS—Johnson Library, University of Texas, Austin; Visitor Information Center, Johnson Space Center, Houston.

VIRGINIA—Visitor Information Center, Langley Research Center, Hampton.

WASHINGTON, DC—National Geographic Museum; Smithsonian Institution, National Air and Space Museum, 1000 Jefferson Drive.

KEY AWARDS

The first Skylab flight crew, Charles Conrad, Jr., Joseph Kerwin and Paul Weitz, were presented the Haley Astronautics Medal at a conference on the scientific experiments of Skylab, sponsored jointly by the American Institute of Aeronautics and Astronautics and the American Geophysical Union, Huntsville AL, Oct. 30-Nov. 1.

The award is given in honor of Andrew G. Haley, a pioneering AIAA official, "for outstanding contributions by test personnel who undergo personal risk in the advancement of space flight."

Astronaut Conrad also recently was unanimously selected by the Council of the Federation Aeronautique Internationale (FAI) to receive its Gold Space Medal for 1973 in recognition of his performance as Commander of the first manned Skylab crew. This is one of two highest awards.

In addition, the Council unanimously selected Astronaut Alan Bean to receive the Yuri Gagarin Gold Medal for 1973, its second highest space award, in recognition of his outstanding achievement as Commander of the second manned Skylab flight.

HEADQUARTERS PRESS RELEASES

(Issued by the Public Information Division, Code FP, Headquarters, Washington, DC 20546. These releases are available only to members of the news media.)

74–262 NASA Shaft Seal for Turbine Engine Reduces Wear
74–263 Satellite Helps Protect Florida Everglades
74–264 Dr. Debus to Retire at KSC
74–265 NASA to Launch Westar-B
74–266 Satellite Demonstration Role in Education and Medicine
74–267 Space Shuttle Fact Sheet
74–268 Note to Editors — ATS-3 Demonstration
74–269 Nuclear Source Converts Directly into Laser Light
74–270 Sea Turtles Released at Kennedy Center
74–271 Balloon Flights Related to HEAO
74–272 NASA Resumes SERT II Testing
74–273 NASA Studies Energy Conversion Alternative
74–274 UK-5 Press Kit
74–275 Delta Rocket to Launch Triple Payload
74–276 Dr. Fletcher Visits Japan
74–277 ASTP Experiment to Study Interstellar Helium

PATENTS FOR INVENTIONS RESULTING FROM NASA RESEARCH

(The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel for the indicated installation.)

Inventor(s) and Employer	*Title and NASA Docket*	*Patent No.*	*Installation*
William Elkins, Eugene Connell and Robert E. Alesna, Garret Corp., Los Angeles, CA	Flexible Joint for Pressurizable Garment (MSC–110/72)	3,832,735	JSC
Lawrence E. Dickens, Westinghouse Electric Corp., Pittsburgh, PA	Millimeter Wave Pumped Parametric Amplifier (GSC–11,617–1)	3,833,857	GSFC
William L. Ray, NASA/MSFC	Remote Fire Stack Igniter (MFS–21,675–1)	3,833,336	MSFC
Edwin S. Hochmair, National Academy of Sciences, Washington, DC	Integrated P-Channel Mos Gyrator (MFS–22,243–1)	3,840,829	MSFC
Judd R. Wilkins and Stacey M. Mills, NASA/LaRC	Apparatus for Microbiological Sampling (LAR–11,069–1)	3,841,973	LaRC
John D. DiBattusta, NASA/LaRC	Determining Particle Density Using Known Material Hugeniot Curves (LAR–11,059–1)	3,842,656	LaRC
Laurence J. Bement, NASA/LaRC	Method of Making an Explosively Welded Scarf Joint (LAR–11,211–1)	3,842,485	LaRC
Charles L. Wyman and Thomas L. Howe, NASA/MSFC	Strain Gauge Ambiguity Sensor for Segmented Mirror Active Optical System (MFS–20,506–1)	3,842,509	MSFC

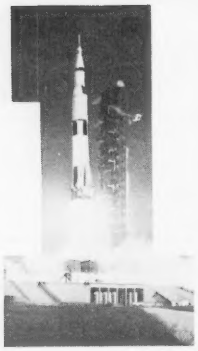
1974 LAUNCH SCHEDULE

Name	*Launch Date*	*Vehicle*	*Range*	*Mission/Remarks*	
Skynet II-A (UK)	Jan. 18	Delta	ETR	Reimbursable launch. United Kingdom's communications satellite.	Unsuccessful
Centaur Proof Flight	Feb. 11	Titan III–E Centaur	ETR	Test flight of booster planned for Viking Mars launch in 1975.	Unsuccessful Engine failure

1974 LAUNCH SCHEDULE–Cont)

San Marco (SM–C2)	Feb. 18	Scout	SM	United States/Italy cooperative mission to conduct air density measurements.	Launched
UK X–4	Mar. 8	Scout	WTR	Reimbursable launch. United Kingdom technology satellite with experiments related to spacecraft power systems, altitude control and stabilization.	Successful
WESTAR–A	April 13	Delta	ETR	Western Union Communications Satellite. Reimbursable launch.	Successful
SMS–I	May 17	Delta	ETR	First prototype/developmental mission for geostationary meteorological operational satellite system; day and night continuous imaging of cloud cover; sophisticated remote-platform data-collection-and weather data relay.	Launched
ATS–6	May 30	Titan III–C	ETR	Developmental and demonstrative communications mission using technology applicable to terrestrial and space needs; utilizes 9.15-meter (30-foot) deployable parabolic antenna and communications system with frequencies in several bands; will support public communications experiments in the U.S. and India.	Successful
Hawkeye (formerly Injun-F)	June 3	Scout	WTR	To study the topology of the magnetic field at large radial distance over the Earth's dgear caps and the interaction of the solar winds with the geomagnetic field.	Launched
AEROS-B (German)	July 15	Scout	WTR	Spin-stabilized, Earth-orbiting satellite designed for upper atmosphere measurements.	Successful
Netherlands Sat.-A (ANS-A)	August 27	Scout	WTR	Designed to obtain data from celestial X-ray and ultraviolet sources.	Launched
WESTAR-B	Oct. 10	Delta	ETR	Western Union communications satellite. Reimbursable launch.	Launched
UK-5	Oct. 15			To investigate galactic and extra galactic X-ray sources.	Launched
Skynet II-B (UK)	Nov. 19	Delta	ETR	Reimbursable launch. United Kingdom communications satellite.	
Intelsat IV F-8	Nov. 21	A-Centaur	ETR	One of a series of communications satellites to form part of a global communication commercial satellite system. Launch for COMSAT.	
Helios-A	Dec. 8	Titan III-E Centaur	ETR	To investigate the properties of and processes in interplanetary space in the direction of and close to the Sun by developing, launching and operating automated spacecraft.	
Symphonie-A (French/German)	Dec. 17	Delta	ETRA	Experimental Communications satellite. Reimbursable.	
Comsat-A	4th Qtr	Delta	ETR	First of two maritime communications satellites to be situated over Atlantic and Pacific Oceans.	
WESTAR-C	(Under Study)	Delta	ETR	Western Union Communications satellite. Reimbursable launch.	
Intelsat IV F-1	(Under Study)			One of a series of communications satellites to form part of a global communications commercial satellite system. Launch for COMSAT.	
GOES-A (SMS-C)	(Under Study)	Delta	ETR	First Geostationary Operational Environmental Satellite, follow-on to SMS missions, funded by NOAA.	

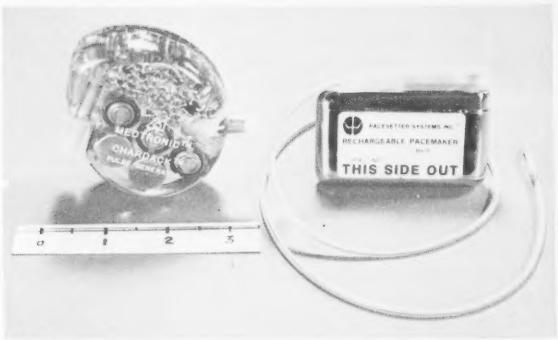
ARE YOU GETTING YOUR



WORTH FROM SPACE?

FOR A PENNY OF YOUR TAX DOLLAR, YOU ARE GETTING ...

A HANDY, RECHARGEABLE HEART PACEMAKER



Electrical and electronic components first designed by NASA for use in spacecraft now are used in a heart pacemaker that is without the drawbacks and discomforts of the conventional type.

The new unit is rechargeable from outside the body for a period of 10 to 20 years and eliminates the need for a patient to undergo an operation every two years for battery replacement. It can be recharged in 90 minutes and stores enough energy to last eight weeks, though the recommended recharge period is once a week. As shown in the illustration on the left, it is one-third the volume, one-half the weight, and one-half the thickness of those formerly in use.

The pacer, the only implanted part of the system, literally can be hidden in the patient's body—under the skin in the upper left or upper right portion of the chest or in the abdomen. It is so immune to electrical interference that it does not turn off even inside an operating microwave oven. It permits easier and faster implants than other devices in clinical use.

No time-limiting components and no radioactive emissions interfere with the smooth operation of the space-designed pacemaker. Six years went into its development in the Applied Physics Laboratory of Johns Hopkins University at Baltimore, MD.

One of the staunchest champions of the new device is Mrs. Kathleen Guarascio of Long Island, New York, shown at right beside a recharger with her 3½-year-old daughter, Jennifer, who was born with a complete heart blockage and a slow heart rate.

In March of 1973, a month or so after the first pacemaker was applied to a human being, Mrs. Guarascio and her family came to Washington, where they heard that space technology was being used in pacemakers. This information came to them at the right moment, for Jennifer was growing worse.

During the following July, Jennifer became one of 60,000 or so Americans who have heart pacemakers implanted each year. It was her first. Its effect was immediate. Her heartbeat was stepped up from a slow rate of 40 to a normal 72 beats a minute.

"Since Jennifer has had the pacemaker," her mother reports, "there has been a complete change in how she has grown. She is acting very normally. She can do anything that any other child can do, whereas before she was unable to play and to keep up with other children.

"The outlook for the future is very good. She won't have to have another pacemaker put in until she is about 15, and that means a great deal to us. The doctors say she can live to be a ripe old age and that she can grow up to be anything she wants to be."

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

"FOR THE BENEFIT OF ALL MANKIND."

AMERICAN REVOLUTION BICENTENNIAL 1776-1976